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618-10 and 618-11 Burial Ground Remedial Design Technical Workshop Summary Report

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

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P.O. Box 1000
Richland, Washington

Contractor for the U.S. Department of Energy
Richland Operations Office under Contract DE-AC06-96RL13200

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L. C. Hulstrom

September 2003

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EXECUTIVE SUMMARY

The 618-10 and 618-11 Burial Grounds Remedial Design Technical Workshop gathered technical experts from several U.S. Department of Energy (DOE) sites, academia, and industry that have experience in dealing with buried waste containing transuranic (TRU) elements. The day preceding the workshop, a vendor fair was held to allow various vendors to display their products that included a wide range of technologies such as in-situ characterization, waste stabilization and removal, and remote handling and packaging. The primary objectives were to identify whether there were existing technologies that could assist in remediating these two burial grounds, as well as to stimulate creative thinking of the workshop participants. In addition, a site tour of the two burial grounds was also provided. The workshop, held on June 10-12, 2003, in Richland, Washington, was designed to share lessons learned and identify issues and potential solutions for waste characterization, excavation methods, stabilization techniques for removal and handling, retrievability and segregation, packaging and transportation, health and safety issues, treatment requirements, final disposal, and compliance with regulatory requirements.

E1.0 GENERAL AREAS OF AGREEMENT

Workshop attendees reached general agreement on the following recommendations for the 618-10 and 618-11 Burial Grounds remedial design.

1. Nuclear Hazard Category

    a. Use an initial Hazard Category (HazCat) of HazCat 2 Nuclear.

    b. Use new characterization information to downgrade activities and areas to equal or less than HazCat 3 Nuclear.

    c. Limit exposed inventory to reduce the HazCat rating of an activity or area.

    d. Work on remediation of the trenches in segments to maintain a lower HazCat rating.

e. Set up staging areas during waste removal to minimize the area that falls under higher HazCat ratings.

2. Characterization

a. Investigate records, such as the logbooks from 300 Area experiments, and interview workers. Do it now before the opportunity is lost.

b. Use an iterative characterization and excavation process.

c. Use an observational approach for characterization and removal.

d. Link characterization, safety and risk analyses, and decision analyses.

e. Use the M-91 facility, T Plant, or a dedicated Hanford Site hot cell to inspect, characterize, and package remote-handled (RH) TRU. Note that some of these plants may undergo deactivation and decommissioning by the time they are needed.

f. Use mobile laboratories for screening and quick turnaround in the field.

3. Excavation

a. Sequence from the easiest to the hardest: (1) 618-10 trenches, (2) 618-10 vertical pipe units (VPU), (3) 618-11 trenches, and (4) 618-11 VPUs and caissons. Investigate the use of an analogous burial ground in the 200 Area if timing and coordination with the 200 Areas Remedial Investigation/Feasibility Study (RI/FS) process permits.

b. Engineer to what is known about the waste and form contingency plans for the unknown to avoid overly conservative engineering.

c. Maintain flexibility for manual versus remote excavation and characterization to address unknowns.

d. Look at treating waste for stabilization and excavation and to meet the waste acceptance criteria.

e. Plan for an extended area of contamination.

4. Sorting, treatment, and storage

   a. Use mobile processing lines for contact-handled (CH) TRU.

   b. Coordinate with the M-91 facility regarding capacity for sorting, temporary storage capabilities, and treatment.

   c. Coordinate with other onsite waste activities for capacity and scheduling for sorting, treatment, storage, packaging, and shipping. Awareness of the 300 Area deactivation and decommissioning schedule will be important for this activity.

5. Transportation

   a. Rail currently is not an option for the Waste Isolation Pilot Plant (WIPP), but it makes sense onsite for transport to the M-91 facility and the Environmental Restoration Disposal Facility (ERDF).

   b. Investigate extending the use of rail in the 300 Area, where the buildings will come down by 2011-2012.

6. Coordination and consultation with others

   a. Coordinate with other onsite and offsite waste projects regarding orphan wastes and planning for surprises.

   b. Coordinate with waste disposal programs when establishing waste acceptance criteria.

   c. Consult with the Waste Receiving and Packaging Facility staff on lessons learned.

   d. Tap into non-DOE technologies.

E2.0 KEY PLANNING ASSUMPTIONS

Workshop participants identified several key assumptions that can be made in developing remedial designs for the 618-10 and 618-11 Burial Grounds.

1. A disposal path exists for all expected wastes.

    a. Low-level waste can go to ERDF; this includes Class B and C low-level waste if it meets the waste acceptance criteria.

    b. RH low-level mixed waste can go to ERDF on a case-by-case basis if it meets the waste acceptance criteria.

    c. Classified low-level waste may be able to go to a trench at the Nevada Test Site, although this requires verification with the site.

    d. Greater than Class C low-level waste can go to onsite Hanford Site burial grounds if it is in a high-integrity container or is grouted.

    e. Low-level mixed waste can go to ERDF with treatment to meet WAC, or an offsite commercial facility.

    f. CH-TRU, RH-TRU, classified TRU, and TRU with polychlorinated biphenyls can go to WIPP.

    g. Pyrophorics can go to onsite mixed waste burial grounds but may require treatment (as CERCLA generated waste).

    h. Spent fuel can go to onsite dry storage and then to Yucca Mountain for disposal.

2. Waste acceptance criteria for all waste types exist or will exist in time for work on the 618-10 and 618-11 Burial Grounds.

3. WIPP’s waste acceptance criteria will not require treatment to land disposal restriction levels.

4. Treatment, packaging, and disposal preparation is available for all waste types except RH-TRU (which is hinging on the M-91 facility) and orphan wastes.

5. RH-TRU destined for WIPP can be placed into 55-gal drums.

6. CH-TRU can be placed into the largest available boxes (up to 5 by 5 by 8 ft).

7. WIPP will be open until 2035.

8. More packaging, transportation, and mobile processing units will be available after 2015.

9. Characterization of the burial grounds is needed in order to identify segments that are HazCat 2 and thereby minimize the total area in this category.

E3.0 KEY QUESTIONS

The workshop participants identified the following key questions which remain to be addressed and potential means to address them.

1. Can the 618-10 and 618-11 Burial Ground remedial design use the same approach used by the Environmental Restoration Contractor on the 618-4 and 618-5 Burial Ground trenches? After obtaining some additional characterization information, excavation would proceed, and contingency plans would be in place for the unexpected or anomalous waste forms.

2. How and when should the determination be made as to whether to use manual or remote methods? Decisions will be made during detailed planning of the work and during field activities.

3. What containment will be needed onsite, including when and where? This determination will be made following characterization and prior to excavation. Fire suppression should be factored into this for any facility/structure that is constructed over the waste site.

4. Is a sensitivity analysis needed to verify assumptions? This is an iterative process during design. A general analysis could be done following the workshop and then be refined as more technologies and information became available.

5. What are the approaches and technologies for removal of VPUs and caissons? Innovative approaches are anticipated from the DOE, Environmental Management Program work.

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FIGURES

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TERMS

AB	Authorization Basis
ATG	Allied Technology Group
BBWI	Bechtel B&W Idaho
C3T	Cleanup Challenges and Constraints Team
CD	critical decision
CERCLA	*Comprehensive Environmental Response, Compensation and Liability Act of 1980*
CH	contact-handled
DOE	U.S. Department of Energy
DOE-NETL	U.S. Department of Energy, National Energy Technology Laboratory
DOT	U.S. Department of Transportation
Ecology	Washington State Department of Ecology
EM-50	U.S. Department of Energy, Environmental Management
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
FSAR	*Columbia Generating Station Final Safety Analysis Report*
HazCat	Hazard Category
INEEL	Idaho National Engineering and Environmental Laboratory
LANL	Los Alamos National Laboratory
LDR	land disposal restriction
LLMW	low-level mixed waste
LLW	low-level waste
MOU	*Memorandum of Understanding Between Energy Northwest and the U.S. Department of Energy, Richland Operations Office for Emergency Preparedness and Response*
MW	mixed waste
N/A	not applicable
NQA	National Quality Assurance
NRC	U.S. Nuclear Regulatory Commission
ORNL	Oak Ridge National Laboratory
PCB	polychlorinated biphenyl
PUREX	Plutonium-Uranium Extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
RCT	radiation control technician
RH	remote-handled
RL	U.S. Department of Energy, Richland Operations Office
ROD	Record of Decision
SAR	safety analysis report
TLD	thermoluminescent dosimeter
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TRUPACT	transuranic package transporter
TSCA	*Toxic Substances Control Act of 1976*

VOC	volatile organic compound
VPU	vertical pipe unit
WAC	waste acceptance criteria
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing

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1.0 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Keith Klein, U.S. Department of Energy (DOE), Richland Operations Office (RL), and Mike Goldstein, U.S. Environmental Protection Agency, opened the workshop by welcoming participants (see Appendix A for a list of workshop attendees). The 618-10 and 618-11 Burial Grounds Remedial Design Technical Workshop gathered technical experts from several DOE sites, academia, and industry who have experience in dealing with buried waste containing transuranic (TRU) elements. The day preceding the workshop, a vendor fair was held to allow various vendors to display their products that included a wide range of technologies such as in-situ characterization, waste stabilization and removal, and remote handling and packaging. The primary objectives were to identify whether there were existing technologies that could assist in remediating these two burial grounds, as well as to stimulate creative thinking of the workshop participants. In addition, a site tour of the two burial grounds was also provided. The workshop discussions focused on sharing lessons learned and identifying issues and potential solutions for waste characterization, excavation methods, stabilization techniques for removal and handling, retrievability and segregation, packaging and transportation, health and safety issues, treatment requirements, final disposal, and compliance with regulatory requirements. RL is responsible for designing a cleanup program that is safe for workers with the least possible exposure; is cost effective, enabling project completion; and uses the best available technologies. The goal of the workshop was to start thinking about these tough issues, gain an understanding of what the vendor community has to offer, obtain feedback from stakeholder groups and regulators, and bring it all together to achieve synergy. This workshop was designed to provide a more specific plan to aid in the development of milestones for the project.

1.2 BACKGROUND INFORMATION

A background briefing package on the 618-10 and 618-11 Burial Grounds was provided to participants before the workshop (see Appendix B). This section summarizes the contents of the package and the presentation.

Kevin Leary, RL, and Larry Hulstrom, Fluor Hanford, outlined background information on the history, contents, and plans for the 618-10 and 618-11 Burial Grounds. The 618-10 Burial Ground operated from 1954 to 1963. It occupies approximately 5.7 acres and is located 2.3 mi west of the Columbia River. The 618-10 Burial Ground has an estimated 127,000 yd^3 of waste, with 11 yd^3 of remote-handled (RH) TRU. Wastes were disposed of in 12 trenches and 94 vertical pipe units (VPU). Most trenches are presumed to contain low-level waste (LLW) and low-level mixed waste (LLMW). The VPU storage units are estimated to contain a mixture of LLMW and RH-TRU.

The 618-11 Burial Ground operated from 1962 to 1967. It spans 8.6 acres and is located 3.6 mi west of the Columbia River. The 618-11 Burial Ground contains an estimated 134,000 yd^3 of waste, with 123 yd^3 of RH-TRU and 13,300 yd^3 of contact-handled (CH) TRU. Wastes were disposed of in 3 trenches, 50 VPUs, and 3 to 5 caissons. Similar to the 618-10 Burial Ground, the trenches predominantly contain LLW and LLMW. The VPUs and caissons are estimated to contain mostly RH-TRU. The proximity of Energy Northwest's Columbia Generating Station, an operating nuclear power plant, to the 618-11 Burial Ground poses a major logistical problem.

The radiological hazards presented by these burial grounds include cesium, strontium, plutonium, americium, and neptunium. Other hazards include beryllium, uranium and zirconium metals, and sodium-potassium metals, some of which are pyrophoric. Limited records were kept for the 618-10 and 618-11 Burial Grounds, and some records have been destroyed. While the general practice was to place the higher activity waste in the VPUs or caissons, RH-TRU likely exists within the trenches. This information is based on limited search results and interviews with people who operated the facilities.

1.3 DRIVERS FOR REMEDIATION

The drivers for remediation of the 618-10 and 618-11 Burial Grounds are as follows.

- DOE/EIS-0113, *Final Environmental Impact Statement for Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes*, and 53 FR 12449, "Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington; Record of Decision (ROD)," specified excavation, removal, and processing of waste from the 618-11 Burial Ground.

- The *Interim Action Record of Decision for the 300-FF-2 Operable Unit, April 2001* (EPA/ROD/R10-01/119) specified complete removal, treatment, and disposal of waste from the 618-10 and 618-11 Burial Grounds.

- Known tritium groundwater contamination was detected in January 1999 at the 618-11 Burial Ground, and this same contaminant spiked in August 2000 at 400 times the maximum contaminant level established for drinking water.

- Elevated levels of nitrate were detected at the 618-11 Burial Ground.

The current schedule calls for remediation of the 618-10 Burial Ground first, starting in 2012. The 618-11 Burial Ground is scheduled to begin remediation in 2014 and to be completed in 2018.

1.4 ISSUES REQUIRING RESOLUTION

Regulatory, technical, logistical, timing, and resource issues that require resolution are associated with the remediation of the 618-10 and 618-11 Burial Grounds. One regulatory issue is the pending Waste Isolation Pilot Plant (WIPP) RH-TRU waste acceptance criteria (WAC). Another issue relates to availability of a facility at the Hanford Site to handle RH-TRU waste. Under Milestone M-91 of Ecology et al. 1989, *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement), a plan for such a facility is to be finished in 2007 and the facility is to be operational by 2013.

Technical issues in need of resolution are as follows.

- The tritium plume and associated risk require continued monitoring and assessment.
- DOE and Fluor Hanford need to decide on a baseline path for the VPUs and caissons.
- Alternatives for characterization and remediation need to be developed.
- Storage and treatment facilities need to be available for waste that cannot go to the Environmental Restoration Disposal Facility (ERDF).
- Storage and treatment needs must be coordinated with RH-TRU retrieved from the 200 Areas.
- A waste handling process will be needed by 2013 when the RH-TRU facility is complete.
- Potential criticality issues may exist during remedial actions for both burial grounds.

Several logistical issues also require resolution. Because of the proximity of Energy Northwest to the 618-11 Burial Ground, remediation of this burial ground may represent a significant risk to workers and a liability to Energy Northwest. Furthermore, waste transportation needs to be evaluated relative to types and numbers of shipments, the potential for road closures, and the use of the rail system. WIPP scheduling for RH-TRU needs to be examined as a potential driver for remediation of the burial grounds. WIPP will conclude normal operations for legacy TRU waste by 2015 and will remain open on a demand basis beyond 2015 until 2035.

Several timing and resources issues are associated with revision of the estimated costs. The $35 million cost estimate for the 618-10 Burial Ground is a parametric estimate based on experience with non-TRU standard solid waste burial grounds. The estimate of $340 million for the 618-11 Burial Ground did not consider initiating the remediation with Energy Northwest still operating. Overall disposal costs strongly depend on the WAC for RH-TRU at WIPP, for which approval is assumed by 2005. There also are limited waste inventory records; therefore, inventory estimates and overall project costs have large uncertainties.

1.5 TECHNOLOGY DEVELOPMENT

Scott Petersen, Fluor Hanford, summarized work that has been performed to identify technology development needs to support remediation of the 618-10 and 618-11 Burial Grounds. A work breakdown structure was developed to identify major tasks that are fully developed, need work, or are not available. Tasks then were matched with technologies, and technology gaps were identified and matched with specific tasks. The technical baseline development was divided into pre-excavation characterization, excavation, and waste handling and transport. Pre-excavation characterization identifies boundaries and wastes. Excavation includes use of heavy equipment, remote handling, and environmental controls. Waste handling and transport includes methods for characterization, segregation, and packaging.

Possible field activities include non-intrusive work, remedial design work, and a treatability test plan. Non-intrusive work needed includes a more detailed surface geophysics survey to expand delineation of burial ground trenches, VPUs, and caisson locations. Remedial design work may include borings next to the VPU units or caissons for downhole radiological dose readings, camera and radiological surveys inside the VPUs or caissons, and excavation to uncover the tops of the VPUs or caissons. A treatability test plan is needed to develop processes for excavation, stabilization, retrieval and handling, characterization, packaging and transportation, safety, storage, treatment, and final disposal.

1.6 DISCUSSION/COMMENTS

Question: Are the VPUs and caissons open at the bottom?
Response: Records indicate that they likely are open. The site is unsure if the concrete footings are solid.

Question: What is the regulatory construct?
Response: This is a *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA) action – an ROD was issued in April 2001 (EPA/ROD/R10-01/119).

Question: Regarding the drill holes around the caissons: will push technology be used for removal?
Response: The technology to be used is open for discussion.

Comment: One of the technical issues addressed should be waste minimization and decontamination equipment. If planned for now, it will result in cost savings.

Question: What is the rationale for starting remediation of the 618-10 Burial Ground first?
Response: The 618-10 Burial Ground is suspected to be less complicated. It also is located further from Energy Northwest.

Question: What is the M-91 facility?
Response: M-91 is a series of milestones documented through the Tri-Party Agreement that call for an RH-TRU facility to be constructed (referred to in this document as the M-91 facility). The final plan for the facility will be finished in 2007 and the facility will be operational in 2013.

Question: What is a HazCat 1 facility?
Response: HazCat 1 refers to an operating nuclear facility.

Question: Are there other burial grounds onsite with similar underground materials?
Response: There are similar caissons in the 200 Areas; the exact number is to be determined. They were generated after the 618-11 Burial Ground was closed.

Comment: Treatment and transport of LLMW should be a focal point.
Response: Approximately 40 or 50 remedial actions will be completed at Hanford Site waste sites and burial grounds before remediation of the 618-10 and 618-11 Burial Grounds begins. Lessons learned for LLMW will be developed from these remedial actions. Caissons and VPUs will not be fully addressed, which is why they are an additional focal point for this workshop.

2.0 LESSONS LEARNED FROM OTHER U.S. DEPARTMENT OF ENERGY SITES

John Bickford, Project Hanford Lessons Learned Coordinator, introduced lessons learned. The definition of a lesson learned is a good work practice or innovative approach that is captured and shared to promote repeat applications, or an adverse work practice or experience that is captured and shared to avoid a recurrence. There are several reasons to share lessons learned, including worker safety, Defense Nuclear Facilities Safety Board criticism of the DOE, *Price-Anderson Amendments Act of 1988* implications, Integrated Environment, Safety, and Health Management System feedback and improvement, cost savings, and because it is required by several DOE orders.

The lessons learned are stored in the DOE information system and can be accessed through the database. Tools for sharing this knowledge include the DOE lessons learned list server, Society for Effective Lessons Learned Sharing list server, websites, conference calls, and semiannual meetings. Although these lessons learned are event-based, the information they provide is timeless (see the presentation in Appendix C).

2.1 IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY PIT 9

John Schaffer, Idaho National Engineering and Environmental Laboratory (INEEL), presented lessons learned from the Pit 9 Retrieval Demonstration Project (also known as the Glovebox Excavator Method Project) (Table 2-1). Unlike the 618-10 and 618-11 Burial Grounds, good records were kept on Pit 9. Pit 9 comprises approximately 1 acre in the Radioactive Waste Management Complex subsurface disposal area. Pit 9 operated from 1967 to 1969. The disposal practice at the site was to excavate to basalt, lay 1 to 5 ft of under burden, dispose of the waste, and top off the site with 3 to 5 ft of over burden. In 1989, Pit 9 made the National Priorities List (40 CFR 300, Appendix B). The ROD then was issued in 1993 (EPA/ROD/R-10-93/070).

Table 2-1. Idaho National Engineering and Environmental Laboratory Lessons Learned. (2 pages)

Construction features – fabric weather enclosure structure	∉ A fire protection equivalency letter is needed. ∉ Vendor issues (e.g., an error with fabric folding for the weather enclosure structure) were experienced. ∉ Ability of the containment system to hold negative pressure should be factored into the design. ∉ Door design can be problematic as a result of the negative pressure. ∉ The facility should be constructed for all climate types, including hot and cold weather and wind. ∉ The ability of equipment to move with ease in the structure needs to be considered in the design.
Construction features – retrieval confinement structure	∉ The design concept should be applied to the largest building scale. ∉ Building features need to include modular structures, ability to be sealed, and penetrations for the rail system.

Table 2-1. Idaho National Engineering and Environmental Laboratory Lessons Learned. (2 pages)

Packaging Glovebox System	∉ Compatibility of the glove port size and gloves, and the glass design should be considered. Stresses in glass occur as the composite is put together. An analysis was performed to see how large a crack could be allowed in the glass. ∉ Chemical compatibility should be addressed in the design. ∉ Video monitoring may raise security issues such as unearthing a classified item. ∉ Load-out tents should be considered.
Project management practices	∉ Requirements and assumptions documents, including project technical and function requirements, early agency buy-in, and a project execution plan, which is the basis for defining scope, should be produced at least 4 months ahead of the deadline to avoid becoming the critical path. ∉ A philosophy of CDs should be followed. A tailored approach is needed under DOE O 413.3, including a structured series of three CDs to match the construction schedule and weather; and obtaining CD-2 approval concurrent with CD-3. A project execution plan is needed for the CD list and risk management planning. ∉ A risk management plan, including identified risks, categorization of risks, a mitigation plan for high and medium risks, and an action items list managed to completion, should be developed. ∉ Agency participation should be obtained early. ∉ Safety analysis report process – This includes defining a critical path for long-lead procurement, performing an analysis and exercising care to establish the upper bound of Pit-9, and establishing levels of confinement (which were driven by the safety analysis report). ∉ Acquisition strategy – BBWI construction forces were used to construct the floor structure, the weather enclosure structure, and the retrieval confinement structure. There is a significant risk for delivery of government-furnished equipment components. The subcontractor scope for site development and mechanical/electrical facility completion should be developed. ∉ Retrieval Confinement Structure building supplier quality program – No building supplier was identified industry-wide with an NQA-1 program in place. The retrieval confinement structure was manufactured under the BBWI Quality Assurance program. Applicable BBWI Quality Assurance program criteria were identified. BBWI generated a detailed subcontract specification that defined supplier and BBWI responsibilities.
Other	∉ After excavation is complete, the pit will be backfilled by pumping in grout, which avoids the problem of bringing in dirt and dusty material, and problems regarding compaction. ∉ A mock-up facility should be used to confirm design features.

ASME NQA-1-2000, *Quality Assurance Requirements for Nuclear Facility Applications*.
DOE O 413.3, *Program and Project Management for the Acquisition of Capital Assets*.
BBWI = Bechtel B&W Idaho.
CD = critical decision.
NQA = National Quality Assurance.

Discussion/Comments

Question: Is the system designed to be scaled up?
Response: No – only for this area.

Question: What drove your design specifications for differential pressure?
Response: The need to maintain confinement. Those are the maximum levels tested. Operation is at lower pressures.

2.2 HANFORD SITE BURIAL GROUNDS – 200 EAST AND 200 WEST AREAS; TRANSURANIC PILOT RETRIEVAL PROJECT

Ken Hladek, Fluor Hanford, presented lessons learned from the Hanford Site Burial Grounds – 200 East and 200 West Areas as part of the TRU Pilot Retrieval Project (Table 2-2). Six burial grounds containing more than 37,000 drums and almost 1,100 boxes and other containers were identified as retrievably stored TRU waste. Preparation began in the summer of 1992 and retrieval was initiated in the summer of 1994 at Burial Ground 218-W-4C, Trench 4. Only a small quantity of waste was retrieved to obtain data on container corrosion, monitor conditions of the container stack, conduct limited TRU waste retrieval activities for operational planning, confirm container placement data records, and obtain waste containers for analysis.

Table 2-2. Hanford Site 200 Areas Lessons Learned.

∉ Mock-up work was helpful for training and for developing procedures.
∉ The Operational Readiness Review is NOT the time to identify gaps or shortcomings.
∉ Visual observations/perceptions are important data considerations.
∉ Plans for potential “anomalies” should be in place.
∉ The placement records system is good.
∉ The tarped module provided a “greenhouse” effect resulting in trapped moisture.
∉ Handling procedures were sound.
∉ Contact between the drum and tarp can increase localized corrosion rates.
∉ The corrosion rate model for Hanford Site drums of about 1 mm per year of uniform corrosion was valid.
∉ A vent clip, a small piece of metal over the lip of the drum, allows escape of volatile gases.
∉ Fire retardant treated plywood interacted with the drums.

Doug Greenwell, Duratek Federal Services of Hanford, Inc., continued the discussion of Hanford Site lessons learned by presenting information on the 218-W-4C and 218-W-4B Suspect TRU Waste Retrieval Project (Table 2-3). Retrieval of 1,466 uncovered, retrievably stored drums was completed between 1999 and 2001. Planning, authorization, and project startup is under way for retrieval of an additional 15,200 drums from trenches covered with a soil interim cap. Records review and assay technology are used to distinguish TRU from LLW. A drum venting system is being procured to install vents and sample ports in drums. Most of the suspect TRU waste is debris with some soils and sludges.

Table 2-3. Hanford Site Suspect Transuranic Waste Retrieval Lessons Learned.

- U.S. Department of Energy Complex-wide experiences are valuable for project planning.
- The transuranic retrieval working group provided valuable sharing of experiences.
- Abnormal operational conditions should be incorporated in planning – containers with pinholes and bulging were anticipated.
- Batch versus continuous production – the mindset should be changed from batching to a full production mentality. This changes the course of the design.
- A mock-up facility was valuable to refine the process, procedures, and emergency preparedness.

2.3 HANFORD SITE 618-4 AND 618-5 BURIAL GROUNDS

John April, Bechtel Hanford, Inc., presented lessons learned from remediation of the Hanford Site 618-4 and 618-5 Burial Grounds, located north of the 300 Area (Table 2-4). The 618-4 Burial Ground operated from 1955 to 1961. The site was partially excavated in 1998, when uranium chips in oil and uranium oxide were encountered. Similar to the 618-10 and 618-11 Burial Grounds, little information was available on the disposed waste. The 618-5 Burial Ground operated between 1945 and 1962. In 1987, a geophysical survey identified waste outside of the burial ground and extended the boundary. Test pits were excavated in 1992 and identified lead bricks, steel, wood debris, and garbage. Based on the 618-4 Burial Ground, the 618-5 Burial Ground was identified as an analogous site and excavated in a similar manner.

Table 2-4. Hanford Site 618-4 and 618-5 Burial Grounds Lessons Learned. (2 pages)

Overall	• Safely keep the waste moving and keep it moving safely. • Remember "it ain't over till it's over." The project was believed to be complete until the ground showed oil spots after drying.
Design	• Characterization versus observational approach – The observational approach worked, but it is necessary to identify specific waste streams or challenges that exist during and following characterization. • Removing waste outside the area of contamination – Sometimes the waste cannot be brought back into the waste site, if needed. • The area of contamination should be enlarged to provide more room and to stay away from staging piles. • Auditable safety analyses (generic versus site-specific) are needed. • Air monitoring (multiple sites versus specific sites) should be conducted. • A fire hazards analysis (pyrophorics and combustibles) should be conducted. Determine how this may impact permitting. • Ask the following analytical questions: What are you sampling for (site closure versus waste management)? How much sampling should take place? How fast can you obtain data? And, at what cost? • Emergency preparedness should be addressed.

Table 2-4. Hanford Site 618-4 and 618-5 Burial Grounds Lessons Learned. (2 pages)

Procurement and mobilization	∉ The subcontracting strategy (prescriptive versus performance) should be considered. ∉ Unit cost versus lump sum contracting should be considered. ∉ The number of submittals should be reduced. ∉ Expectations for required documentation should be defined before mobilization.
Remediation	∉ Remediation site boundaries (exclusion zones, containment areas, radiological buffer areas) should be managed. Fifty feet is the recommended distance for an exclusion area. ∉ Staging piles provide an efficient way to perform primary and secondary sorting. Consider the following: the production rate is difficult to predict; it is difficult to predict the amount of treatment required (i.e., land disposal restricted material); and staging piles provide surge capacity for excavation and sorting. ∉ Know the waste streams, including data, waste acceptance criteria requirements, and waste profiles. ∉ Have the right plan and controls to address anomalies. ∉ Good planning equals teamwork and good implementation. ∉ Teamwork is key to addressing employee concerns and safety. Conduct onsite interviews.

Discussion/Comments

Question: How was the site monitored?
Response: We used the security infrastructure at the Hanford Site. Regarding transportation, we did not want anyone to crash into us. Drums weighed 1,000 lb, so theft was not a concern.

Question: What was the cause of the fire?
Response: The thermite in aluminum.

2.4 LOS ALAMOS NATIONAL LABORATORY TRANSURANIC WASTE INSPECTABLE STORAGE PROJECT

Charlie Villareal, Los Alamos National Laboratory (LANL), presented lessons learned from the TRU Waste Inspectable Storage Project (Table 2-5). Three storage pads make up this area. Pad 1 was operational from 1979 to 1986, Pad 2 was operational from 1981 to 1985, and Pad 3 was operational from 1985 to 1991. The project finished two years ahead of schedule and saved $18 million.

Table 2-5. Los Alamos National Laboratory Lessons Learned.

- Rust inhibitor on drums worked well. Out of 16,000 drums, only 10 to 12 percent had corrosion.
- Keep workers at a distance from the pile by using a forklift to grab the drum.
- The air support dome restricted movement of equipment. The site used 10-wheel dollies, as opposed to forklifts, to transport drums.
- Climate extremes and ventilation should be considered when constructing the dome. LANL placed temporary lightning protection around the pad in the form of poles.
- Using citrus cleaner to degrease drums is labor intensive. LANL suggests purchasing a drum-washing system to reduce the labor. A MART Cyclone* was used for this project and generated only 1,500 gal of water to treat after washing 15,000 drums (the water was re-used).
- Work around prevailing winds.
- Ensure an adequate number of RCTs. RCTs created a bottleneck because of the cleaning necessary before preparation of facilities. Increasing the number of RCTs from two to six was beneficial.
- Build a firewall. A 4-ft firewall was built behind the fiberglass-reinforced plywood crates.
- Powered air-purifying respirators help to cool workers during the summer months.
- Consistent management involvement, including field and worker discussions, ensures good daily operations. Input from workers may result in improved techniques.
- Cross-train the workers; there was only one truck driver, so a laborer was used to transport the drums.
- Plastic and plywood serve as a good barrier between drums and over-burden materials.

*MART Cyclone is a trademark of the Mart Corporation, Inc., Maryland Heights, Missouri.

LANL = Los Alamos National Laboratory.
RCT = radiation control technician.

Discussion/Questions:

Question: What were the levels of contamination?
Response: Pad 4 had 150,000 counts of alpha.

Question: How did you deem over-burden material to be clean?
Response: Environmental Restoration and Compliance took samples throughout the pad and shipped them to the laboratory, and the samples came back clean.

Question: What were the benefits of washing drums versus the possibility of opening pinholes as a result of the washing?
Response: Washing drums allowed for a closer look by *Resource Conservation and Recovery Act of 1976* (RCRA) inspectors. Rust inhibitor left on drums can look like radioactive waste, which could cause confusion for inspectors.

2.5 OAK RIDGE 22-TRENCH AREA TRANSURANIC WASTE RETRIEVAL PROJECT

David Bolling, Oak Ridge National Laboratory (ORNL), gave a presentation on the 22-Trench Area TRU Waste Retrieval Project (Table 2-6). The objective of the project was to design, excavate, retrieve, handle, package, transport, and stage waste material buried in 22 unlined trenches in Solid Waste Storage Area 5 North containing 204 retrievable casks, 18 boxes, and 12 drums.

Table 2-6. Oak Ridge National Laboratory Lessons Learned.

∉ Capture historical documentation and worker knowledge early in the process. A key contributor passed away before all questions were answered.
∉ Make all data and information available to formulate design criteria.
∉ Use an evaluated procurement weighted more on the technical approach than on the price. An approach that is 75 percent technical and 25 percent price was suggested.
∉ Provide clear grading criteria for proposals before evaluation. Ensure that the team understands the criteria.
∉ Use a teaming approach with all stakeholders.
∉ Employ a flexible or fluid approach to achieve the final goal.
∉ Understand the known risks, develop contingencies, and share the risks with the team. The request for proposal was developed for the base price of known conditions, and a unit price was developed for unknown conditions as part of the proposal.
∉ Develop a documented safety basis and design/method of accomplishment concurrently.

2.6 WASTE ISOLATION PILOT PLANT REQUIREMENTS AND SCHEDULES

Dave Moody, LANL, provided a summary of the WIPP requirements and schedules. An update to the inventory for recertification for the repository occurs every five years. RH-TRU figures are increasing. It is a realistic expectation that work performed at the Hanford Site may influence the RH-TRU WAC.

The contents of the containers need to be determined before they are shipped to WIPP via truck. Waste is disposed of 2,150 ft underground at the WIPP facility. The first panel of rooms at WIPP has been filled and WIPP presently is working on filling the first room of the second panel. The WIPP *Transuranic Waste Performance Management Plan* (Carlsbad 2002) will save 20 years on disposition time and $8 billion. There is a possibility that WIPP still will be receiving waste through 2035. There currently is very little treatment capacity for TRU.

Regarding modular/mobile waste characterization, the costs per container are down from $20,000 to $2,750. The Savannah River Site has partnered with WIPP to remediate and package waste. This partnership runs five shipments per week, which amounts to 180 containers.

Currently, each step in the waste characterization process for CH-TRU undergoes several steps to ensure that requirements meet the National Academy of Sciences recommendations. If one step in a long chain of processes cannot be completed, the entire process is halted. If waste requiring treatment is encountered, it is a showstopper. The National Academy of Sciences has twice recommended the elimination of waste characterization requirements that add little or no value and increase the potential for worker exposure. WIPP is proposing that one characterization program should exist for both CH-TRU and RH-TRU, relying on process knowledge and characterization. Under the proposed streamlining process, headspace gas sampling would be eliminated unless flammable gases are expected. Monitoring at the repository would replace the sampling of each drum. Another aspect of characterization to streamline is the regulation that defines RCRA compliance for TRU waste characterization, rather than being required to meet multiple requirements for multiple regulators. Further, this is a compliance-driven process, but it should become a performance-driven program.

Discussion/Comments

Question: Would RH-TRU requirements be the same as those for CH-TRU?
Response: We would like the same requirements for CH-TRU and RH-TRU, but not the same requirements we currently have in place.

Question: What is the current forecast for getting a RH-TRU permit modification in place?
Response: We are working toward a single set of requirements. We are trying to accelerate on the 2005 schedule.

Question: Will additional boxes be allowed in the future for the transuranic package transporter (TRUPACT)-3?
Response: TRUPACT-3 has been designed and constructed for testing right now. Approximately 19 ft is the length limit for disposal at WIPP. Ninety percent of the boxed waste is 4 by 4 by 7 ft.

Question: What is the prognosis for rail transport?
Response: Two rail studies are ongoing: a WIPP project analysis, and a DOE-Headquarters analysis. TRUPACT-2 or -3 can be transported by rail. TRUPACT-3 can be transported by truck or rail. It comes down to cost and negotiated inspection points. Overall, trucks seem to be the preferred method of transport.

Question: How will things change if the Hanford Site gains the status of a western “hub site?”
Response: WIPP will deploy the same equipment whether or not the Hanford Site becomes a hub.

2.7 WRAP-UP DISCUSSION

Participants were invited to raise other issues or share additional lessons learned. The issues and lessons learned then were divided into the categories shown in Table 2-7 and prioritized by participants for the breakout sessions to follow.

The following issues, relating to procurement, were identified but not planned for inclusion in workshop or breakout discussions:

- Prescriptive versus performance-based contacts
- Unit cost versus lump sum
- Are submittals necessary?
- Define expectations/“what ifs”
- Make data and information available to formulate design criteria
- Weight more on technical approach (75 percent) than price (25 percent)
- Clear grading criteria for proposal before evaluation
- Sharing risk (DOE/contractor).

Table 2-7. Lessons Learned and Issues Identified. (2 pages)

Regulatory and TRU Issues	Health and Safety	Characterization Needs and Methods	Excavation	Treatment, Storage, and Disposal	Transportation and Packaging
∉ Single set of RH-TRU and CH-TRU regulations; (how to characterize and confirm?)* ∉ Major permit changes take time ∉ Performance is compliance driven ∉ Hazards categorization – type of nuclear facility* ∉ Risk analysis – residual risk/closure – leads to cleanup approach ∉ Basis for acceptable knowledge leading to WIPP disposal* ∉ Flexible approach to achieve final goal ∉ Clarify "requirements" definition (applicable or relevant and appropriate requirements)	∉ SARs – concurrent development of safety basis and design ∉ Pre-job briefing* ∉ Issues associated with characterization ∉ Consider occupational/public limitations ∉ Hazard code categorization ∉ Hazards assessment is the driving force* ∉ Nuclear issues – to alleviate concerns ∉ Establishing good decontamination and containment procedures given proximity to public ∉ Use of remote cameras ∉ Monitoring system – watch for subtle trends ∉ As good a characterization as possible before excavation ∉ Technical gaps in monitoring (i.e., tritium) – dose issue ∉ Stakeholder outreach; communication plan	∉ Pre-excavation characterization vs real-time characterization ∉ Verification and characterizing residuals ∉ Staging of waste ∉ Cost/benefit consideration of risk ∉ Consideration of material handling up front – real cost may be here ∉ Characterization vs observational approach*	∉ Plan for waste minimization ∉ Mock up for design, equipment, and procedure change ∉ Construction features (fabric folding, negative pressure, door design, etc.) ∉ Glovebox design (glove/port size, glass, chemical compatibility, video monitors) ∉ Plan for abnormal conditions* ∉ Batch vs continuous production differences ∉ "Safely keep waste moving and keep it moving safely" ∉ Glove bags ∉ Flexible approach to achieve final goal* ∉ Automation when it makes sense* ∉ Alternative equipment (mining, etc.) and technology development (vacuum, magnets) ∉ Shielding issues/containment (think neighbors)*	∉ Treatment capacity is limited, but is a showstopper ∉ Orphan waste will need a temporary storage facility until WAC are developed ∉ Treatment, storage, and disposal of classified waste ∉ Conduct up-front waste profiling; further defined as time progresses* ∉ WAC for all potential waste types in 618-10 and 618-11 Burial Grounds for all disposal facilities/pathways. Is Yucca Mountain a possibility?* ∉ Container design/ longevity ∉ Hanford Site solid WAC for other waste types. What can go where? ∉ Consider schedule and proper blend with soils for disposal at ERDF. ∉ Rad-contaminated soils ∉ Facility needed to sort wastes once excavation occurs. Locate onsite or offsite?	∉ Central confirmation facility instead of hubs ∉ Schedule delays due to limited number of TRUPACTs and high volume of waste ∉ Security, safeguards ∉ Public accessibility to roadways/transportation routes for waste ∉ Volume vs activity ∉ Consideration of casing for transportation of RH-TRU or spent fuel to Yucca Mountain.* Consideration of WAC.* What is the fate for waste greater than Class C LLW?* TRU 7a certification.* ∉ Shielding and cast requirements for shipment ∉ TRUPACT-3 – added flexibility for retrieving material and size reduction. Influence specifications ∉ Trucks more cost effective than rail (generally). Consider in relation to 300 Area skyline – there may be a need to add a rail spur.*

Table 2-7. Lessons Learned and Issues Identified. (2 pages)

Regulatory and TRU Issues	Health and Safety	Characterization Needs and Methods	Excavation	Treatment, Storage, and Disposal	Transportation and Packaging
	∉ Add to teamwork – don't take shortcuts when addressing worker concerns ∉ Trade-off between manual vs automated equipment* ∉ Emergency plans for internal/external situations; communication plan* ∉ Radiological safety ∉ Involve workers ∉ Anticipate and train for hazards ∉ Coordinate with vicinity properties/ adjacent landowners ∉ Coordinate with Energy Northwest for onsite and offsite employees		∉ Keep it moving (conveyor, etc.) ∉ Plan ahead for area of contamination* ∉ Staging piles are a good way to sort – but production/treatment rates are difficult to predict*	∉ What are the limits of the onsite area right now? How to define limits? ∉ Rust inhibitors	

NOTE: Priority is indicated by an asterisk (*).

CH = contact-handled.
ERDF = Environmental Restoration Disposal Facility.
LLW = low-level waste.
RH = remote-handled.
SAR = safety analysis report.
TRU = transuranic.
TRUPACT = transuranic package transporter.
WAC = waste acceptance criteria.
WIPP = Waste Isolation Pilot Plant.

3.0 RESULTS OF BREAKOUT SESSIONS

In breakout sessions, participants continued to brainstorm issues related to the session topic as well as potential solutions to those issues.

3.1 BREAKOUT SESSION 1: REGULATORY AND TRANSURANIC ISSUES

Objective: Identify potential technical issues and constraints relating to regulatory and TRU requirements, and identify technical strategies to address them (Table 3-1).

Table 3-1. Assumptions to Support Issues Discussion. (2 pages)

Sorting	∉ The current amount of RH-TRU does not warrant processing onsite. ∉ Processing RH-TRU is to take place at T Plant or the M-91 facility. ∉ If appropriately sized, CH-TRU goes to a mobile unit for characterization, sorting, and possibly packaging. ∉ After removal, characterization, and sorting in the field in a mobile unit, CH-TRU will be shipped from the burial ground for processing, packaging, and disposition. ∉ A cost-effective and safe procedure already will be in place to remediate the trenches by the time work begins on the 618-10 and 618-11 Burial Grounds. The Hanford Site will have multiple experiences by this time. ∉ Appropriate facilities exist to accommodate orphan wastes. ∉ Material may have to be packaged at the trenches, either to prepare the waste for ultimate disposal or for transportation to a processing facility not located at the burial grounds.
Waste types and disposition pathways	∉ The following go to the ERDF (<100 nCi/g TRU in accordance with CERCLA): MW, RH-MW/LLW, Class B and C wastes, and LLW. ∉ MW is treated in accordance with land disposal restrictions as needed. ∉ RH-TRU and CH-TRU, PCB TRU, and MW (as needed) go to WIPP. ∉ Pyrophoric and corrosive MWs are excluded from WIPP. ∉ Greater than Class C waste goes to LLW burial grounds under RCRA (DOE O 435.1 allows disposal onsite). ∉ Spent fuel goes to Yucca Mountain. ∉ A cost-effective and safe procedure already will be in place to remediate the trenches by the time work begins on the 618-10 and 618-11 Burial Grounds. The Hanford Site will have multiple experiences by this time. ∉ Logbooks of 300 Area experiments may not provide details regarding the contents of the burial grounds; further investigation of the logbooks presently stored in the 327 Building may be beneficial. ∉ There may be greater than HazCat 3 waste in trenches.

Table 3-1. Assumptions to Support Issues Discussion. (2 pages)

Retrieval	∉ Remote capabilities will be used for caissons, VPUs, areas of high radiation, and anomalous waste in trenches. ∉ A structure will be placed over the dig operation of trenches and VPUs/caissons, unless site characterization dictates otherwise. ∉ Consideration will be given to the potential for airborne alpha release associated with the trenches. ∉ There is a potential to separate the waste sites – VPUs/caissons into HazCat 2 and trenches into HazCat 3. ∉ A HazCat 2 safety analysis, including external review, will be performed. ∉ Schedule delays will result if the hazard level is raised from HazCat 3 to HazCat 2. ∉ A segmented approach to hazard categorization will be used to address trench retrieval separate from VPUs and caissons. ∉ Remediation of CH-TRU will take place first and the area will be used for operations to avoid expanding beyond the 9-acre area of contamination. ∉ No staging will take place on top of VPUs and caissons. ∉ Two possible sequencing scenarios exist: caissons first to get the facility downgraded, or trenches first to use that area for staging. ∉ Segmentation will be maintained during retrieval. ∉ Trenches probably are the most difficult because of the huge volume of waste. The VPUs/caissons have a much smaller volume. ∉ A cost-effective and safe procedure already will be in place to remediate the trenches by the time work begins on the 618-10 and 618-11 Burial Grounds. The Hanford Site will have multiple experiences by this time.
Other	∉ Upgrades of the HazCat level are difficult and produce delays. ∉ Some waste was put in a cask for shipping and then it was placed in a VPU/caisson. All other waste was disposed of in trenches. ∉ VPUs/caissons will be treated as RH-TRU operations during excavation. ∉ RH-TRU will be placed into 55-gal drums and shielded overpacks. ∉ The baseline for trenches is the standard waste box, which could be increased to 5 by 8 ft. ∉ The largest box possible for loading will be used. ∉ The lack of data that can be referenced is the most crucial data gap. ∉ Volume can be better estimated than activity.

Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 USC 9601 et seq.
DOE O 435.1, *Radioactive Waste Management*.
Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.

CERCLA = *Comprehensive Environmental Response, Compensation and Liability Act of 1980*.
CH = contact-handled.
ERDF = Environmental Restoration Disposal Facility.
HazCat = Hazard Category.
LLW = low-level waste.
MW = mixed waste.
PCB = polychlorinated biphenyl.
RCRA = *Resource Conservation and Recovery Act of 1976*.
RH = remote-handled.
TRU = transuranic.
VPU = vertical pipe unit.
WIPP = Waste Isolation Pilot Plant.

Key Questions

Key questions associated with the project baseline were developed to spur thinking regarding potential solutions.

1. What are the steps between start in 2012 and end in 2018?
2. Who are the endpoint recipients of waste, such as ERDF, WIPP, and Yucca Mountain?
3. What are the existing facts, assumptions, and requirements that define the framework to meet objectives?
4. What are the decision milestones to move the schedule forward?
5. Do the results of this workshop drive the design of the M-91 facility and other processes?
6. What is the functional analysis?
7. What questions are essential to drive costs?
8. What are the future land uses?
9. What are the cleanup roles?
10. What are the assumed waste receptacles/paths?
11. What vendor assumptions are associated with a specific dig (work hours, plans, etc.)?
12. When is a documented safety analysis needed?

Other Issues Discussed:

Issue: What do we need to know to comply with regulations and WIPP requirements?
Discussion: Read the existing requirements for CH-TRU WAC (DOE/WIPP-02-3122, *Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Project*), TRUPACT-2, and NM4890139088-TSDF, *Waste Isolation Pilot Project Hazardous Waste Facility Permit*. The WIPP WAC for RH-TRU (DOE/WIPP-02-3214, *Remote-Handled TRU Waste Characterization Program Implementation Plan*) will require a combination of process knowledge and characterization to meet the "acceptable knowledge" requirement and then will require statistical analysis and nondestructive assay.

Issue: When will the WIPP RH-TRU WAC (DOE/WIPP-02-3214) be available?
Discussion: The draft is available now.

Issue: Will the WIPP closure be accelerated?
Discussion: Closure is set for 2035. The major impact to this project will be the additional availability of transportation resources after disposition of the TRU legacy wastes by 2015.

Issue: What RH-TRU handling capabilities will be available from the M-91 facility versus mobile vendors?
Discussion: Mobile vendors will target a higher volume of packages. The M-91 facility will need to have repackaging capabilities. A suite of capabilities will be needed, both on- and offsite, to treat large packages.

Regulatory and TRU Issues

Table 3-2 represents key issues taken from the previous day's discussion. Participants identified potential solutions associated with each issue.

Table 3-2. Regulatory and Transuranic Issues. (2 pages)

Issues	Potential Solutions
Basis for acceptable knowledge	∉ Locate additional background information. ∉ Consider volume versus radioactivity. ∉ Analyze best screening technologies. ∉ Conduct onsite characterization. ∉ Perform testing on the 200 Area 218-W-4B Caissons for compatibility with screening technologies. ∉ Explore the suite of remote-handling capabilities from the M-91 facility. ∉ Use probing to characterize. Bore holes adjacent to VPUs and caissons, or punch holes and insert radiation detectors or cameras. ∉ Investigate DOE-NETL program equipment standardization. ∉ Obtain RH-TRU equipment/technology/expertise from LANL in the future (LANL has negotiated to remove a small amount of RH-TRU waste, mostly in 55-gal drums). ∉ Use radiological field mapping, using known techniques, to characterize. ∉ Use all passive and active analytical techniques (neutron and gamma) to obtain a map of the radiological fields of VPUs, caissons, and trenches. ∉ Perform soil gas isotopic analysis. ∉ Make a test pit for trenches. ∉ Use the M-91 facility for RH-TRU and MW certification. ∉ Identify the potential dose rate, and then make conservative assumptions. ∉ Locate logbooks for experiments performed in the 300 Area facilities for additional information; logbooks may be stored in the records holding area in Seattle. Further investigation of the logbooks presently stored in the 327 Building may be beneficial.

Table 3-2. Regulatory and Transuranic Issues. (2 pages)

Issues	Potential Solutions
Baseline	∉ Use a holistic approach, knowing that the individual packages are not intact. ∉ Address according to waste type, such as LLW in the trenches and high-level waste in the VPUs and caissons. ∉ Investigate regulations for RH-TRU high-level waste. ∉ Address the range of risks (i.e., pyrophorics), not just radioactive risks. ∉ Avoid treating the entire area as RH-TRU by determining the handling of VPUs, caissons, the unknowns, and high-concentration areas. ∉ Be conservative in assumptions and downgrade as the project progresses. ∉ Start at the end date and work backwards to meet regulatory requirements. ∉ Be familiar with deliverables under DOE O 413.3. ∉ Define a process to verify/refute assumptions and plan for contingencies, if assumptions are invalid. ∉ Define the end state.
WIPP	∉ Plan for 55-gal drums for RH-TRU. ∉ Put CH-TRU in biggest possible boxes. ∉ WIPP will be available from 2018 to 2035. ∉ Investigate the WIPP *Transuranic Waste Performance Management Plan* (Carlsbad 2002); perhaps the same characterization techniques can be used for CH-TRU and RH-TRU. ∉ Review RH-TRU documents submitted to agencies.
Hazards categorization	∉ Begin with a high category, and then move to a lower category as more information becomes available. ∉ Ensure consistency with categorization techniques. There are other sites at the Hanford Site that are not treated as HazCat 1 or HazCat 2, but as radiological. ∉ Conduct some characterization before designation as a HazCat 1, 2, or 3. ∉ Conduct a formal assessment to verify the projection of RH-TRU.
Risk analysis	∉ Focus attention on areas that are highly sensitive.

DOE O 413.3, *Program and Project Management for the Acquisition of Capital Assets*.
Carlsbad, 2002, *Transuranic Waste Performance Management Plan*.

CH = contact-handled.
DOE-NETL = U.S. Department of Energy, National Energy Technology Laboratory.
HazCat = Hazard Category.
LANL = Los Alamos National Laboratory.
LLW = low-level waste.
MW = mixed waste.
RH = remote-handled.
TRU = transuranic.
VPU = vertical pipe unit.
WIPP = Waste Isolation Pilot Plant.

3.2 BREAKOUT SESSION 2: HEALTH AND SAFETY (INCLUDING RADIOLOGICAL) ISSUES

Objective: Identify the potential technical issues and constraints related to health and safety, and identify the technical strategies/technologies to address them.

Participants in the health and safety breakout session built on the list of issues that had been started in the plenary session, brainstormed potential solutions, developed evaluation criteria, applied those criteria to selected solutions, and made recommendations on whether the solution should be considered in the future.

Health and Safety Issues:

1. **Hazards assessments without adequate data –** One of the major issues identified by workshop participants is the challenge of conducting hazard assessments without adequate data. A related issue is that remediation of the 618-10 and 618-11 Burial Grounds will affect two different sites with different health and safety issues: the Hanford Site workers remediating the burial grounds and the staff who work at Energy Northwest (the public). Therefore, there is a need to separate worker health and safety from public health and safety, although some concerns overlap between the two:

    a. Public:

        i. Decontamination and containment procedures are needed for the nearby public. The process for defining daily work lines of communication should work well.

        ii. Plans must be interchangeable (e.g., the safety analysis report, air monitoring, fire hazard)

        iii. Nuclear and criticality safety (also affects workers)

    b. Worker:

        i. Consider the health and safety risks of characterization itself

        ii. Radiological safety issues/high dose rates

        iii. Energy Northwest has to reevaluate its control room habitability analysis

        iv. Nuclear and criticality safety (also affects the public)

        v. Industrial hazards were initially listed as a concern for workers, but because the risks of industrial hazards are known, the issue was removed from this category.

2. **HazCat level and what it means for health and safety –** In addition to what the HazCat level dictates for health and safety, workshop participants identified the related issues of determining whether worker or public health is the driver for HazCat, and expressed

concern regarding the potential for overly conservative engineering solutions that become non-implementable.

3. **Dealing with unexpected materials –** One of the greatest challenges of remediating the 618-10 and 618-11 Burial Grounds is the high likelihood of encountering unexpected waste types. This has profound impacts on health and safety. In addition to characterization before excavation and real-time characterization capabilities during excavation, session participants emphasized the importance of contingency plans and engineering flexibility. Excavation plans should include hold points and should be developed for 90 percent of the material, with contingency plans for the other 10 percent. In addition, there should be an on-call list of experienced people who could assist when unexpected materials are encountered.

4. **Monitoring systems and technology gaps –** Monitoring systems and associated technology gaps are an important issue relevant to health and safety. Coordination with Energy Northwest on monitoring was identified as an essential component of the monitoring system.

5. **Emergency plan coordination and communication.**

6. **Tritium in groundwater –** Water used for dust control could drive tritium into the groundwater. Will volatilization of tritiated water already present in the burial grounds affect the power plant?

7. **Tradeoffs of manual versus automation –** This issue was moved to the excavation methods breakout session. After considering adding this issue as an additional evaluation criterion, session participants instead realized that they had implicitly considered the tradeoff through the cost and ease of implementation criteria. The tradeoff involves cost versus risk reduction, which requires an engineering study to define where to invest in remote systems as opposed to the “muck and truck” approach.

8. **Land use and end state** (policy issue to be explored in another forum).

9. **Regulatory flexibility** (policy issue to be explored in another forum).

Evaluation Criteria:

Workshop participants identified the following evaluation criteria, and subsequently ranked potential solutions as high, medium, or low for each criterion:

1. Impacts on health and safety

2. Cost

3. Ease of implementation

4. Effectiveness

5. Technical maturity

6. Industrial hazards. NOTE: Solutions were not evaluated against this criterion because it was added at the conclusion of the breakout session. However, it should be considered in future evaluations. Although industrial hazards are straightforward and processes are in place to address them, it is the most immediate and common risk to workers and as such deserves increased attention.

Issues and Evaluations

Tables 3-3 through 3-6 present a summary of the health and safety issues. The group did not have time to evaluate all of the issues it had identified. The extent of discussions is summarized in Table 3-7.

Policy Issues

The workshop participants identified several policy issues that must be addressed. Because this was a technical workshop, participants flagged these issues for other groups to address in the future.

1. Land use and end state – The land use and end state of the burial grounds is a policy issue that must be addressed. The ROD (EPA/ROD/R10-01/119) is for industrial cleanup standards. The U.S. Environmental Protection Agency (EPA) had pushed for unrestricted use, but because Energy Northwest had already established an industrial cleanup plan, RL decided to retain that plan. Energy Northwest's license will expire in 2023 and the company intends to request an extension for 20 more years. Coordinating with Energy Northwest regarding its long-term planning will be necessary, especially with regard to the parking lot at the Energy Northwest facility. The parking lot closest to the 618-11 Burial Ground will need to be closed to serve as a staging area for excavation of the burial grounds. However, during outages, parking for an additional 800 to 900 Energy Northwest employees and visitors is needed.

2. Regulatory flexibility – A potential approach to remediation activities would be to solidify the caisson contents as a monolith and then bury it somewhere onsite such as at the ERDF. Although this approach would be easier, safer, and cheaper, it may not provide enough protection. There may be some tradeoffs with health and safety regarding treatment and disposal of TRU wastes. Regulatory flexibility, both internally and externally, may be a solution to some of the health and safety issues.

Table 3-3. Issue: Hazards Assessment Without Adequate Data. (2 pages)

Potential Solutions	Health and Safety	Cost	Ease of implementation	Effectiveness	Technical Maturity	Recommend to Consider?
Consult workers on plans for hazards; seek continuity from an experienced work force	High	Low	High	High	N/A	Yes
Bounding hazard analysis	High	Medium	Medium; the bounding analysis itself is moderately easy to implement, but its consequences could result in high costs. The bounding analysis may introduce technological challenges in design and operations and may drive overly conservative engineering	High; bounding analysis will be highly effective, but consequences may make solution difficult to implement and expensive	High	Yes
Statistical tools for risk analysis, coupled with optimization techniques/ systems engineering	High	Low	Medium; development can take considerable time and effort, if balancing many tradeoffs. Long design may be necessary	High; because of resulting optimization	Medium; development costs may be involved	Yes
Contingency plans for unexpected waste	High	Medium; plan itself is low cost, but materials required to fulfill the plan will increase cost	Medium; may be more involved because of potentially high radiation sources	High	N/A	Yes
Coordination with Energy Northwest operations	High	Medium	High	High	N/A	Yes
Use a graded approach to health and safety in conjunction with monitoring and characterization; (related to the issue of) segmentation of health and safety per waste stream	High	Low	High	High	High	Yes
Check K Basins data on spent fuel and nuclear model data	High	Low	High	Medium; because of many uncertainties. Applicability is questionable.	N/A	Yes

Table 3-3. Issue: Hazards Assessment Without Adequate Data. (2 pages)

Potential Solutions	Health and Safety	Cost	Ease of implementation	Effectiveness	Technical Maturity	Recommend to Consider?
DOE/regulatory flexibility	High	Medium; depends on the level of flexibility under consideration (i.e., encasing VPUs and sending to ERDF would require *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989) and public processes).	Low; difficult to accomplish	High; good return on investment, if successful. Setting precedents affects the entire DOE Complex and compounds either effectiveness or ineffectiveness.	N/A	Yes

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*.

DOE = U.S. Department of Energy.
ERDF = Environmental Restoration Disposal Facility.
N/A = not applicable.
VPU = vertical pipe unit.

Table 3-4. Issue: Hazard Category Level and What it Dictates for Health and Safety.

Potential Solutions	Health and Safety	Cost	Ease of implementation	Effectiveness	Technical Maturity	Recommend to Consider?
Solutions and evaluations from the issue, "Hazards assessments without adequate data," (Table 3-3) apply to this issue.	--	--	--	--	--	--
Minimize the exposed inventory.	High	Low to medium; because of decreased productivity	High	High	--	Yes
Ensure that limits in the AB are high enough to cover any unknowns that could be encountered (do the AB work before design). Review the AB as planning progresses.	High	Extra high; because of risk of overly conservative engineering	Medium; AB is easy and engineering may be difficult	High	--	Yes

AB = Authorization Basis.

Table 3-5. Issue: Dealing With Unexpected Materials.

Potential Solutions	Health and Safety	Cost	Ease of implementation	Effectiveness	Technical Maturity	Recommend to Consider?
Pre-excavation characterization to the extent practical	Medium; because of impacts of characterization itself	Medium; depends on how much	Medium; depends on technology	Medium; has potential to be high because minimizes uncertainty	Medium; depends on technology	Yes
Real-time characterization	Low	Medium; ranges from low to high, depending on technology used	High	Medium; depends on technology	Medium; depends on technology	Yes
Contingency plans/ engineering flexibility/ robustness; on-call list of experienced people	Low	Low	Medium; plan is easy. Implementing the plan may be difficult	High	--	Yes

Table 3-6. Issue: Monitoring System and Technology Gaps.

Potential Solutions	Health and Safety	Cost	Ease of implementation	Effectiveness	Technical Maturity	Recommend to Consider?
Real-time characterization	Evaluated in the “Dealing with Unexpected Materials” issue (Table 3-5)					
Technology development	Low by definition	Medium	Low	High	Low	Yes
Integrating monitoring systems and sharing between the U.S. Department of Energy and Energy Northwest	Low	Low	High	High	High	Yes
Enhanced personnel monitoring; enhanced bioassay	Low	Medium	Medium; easy to implement, challenge is the resistance to change	High; depends on speed of data turnaround	Medium	Yes
More robust field instruments (most instruments are designed to work indoors – instruments need to work in cold temperature, wind, etc.)	Low	High	Medium; depends on cultural factor	High	Medium; technology exists but is not commercially available	Yes

Table 3-7. Issues Not Evaluated.

Issue	Potential Solutions
Emergency plan coordination and communication	∉ Outreach to workers and stakeholders regarding risks. ∉ Manage buffers. ∉ Plan for earthquakes, volcanoes, floods, etc. ∉ Note that the 618-10 and 618-11 Burial Grounds are located in Energy Northwest's exclusion area for emergencies. ∉ Plan for notification/evacuation of Energy Northwest. ∉ Trade drills and exercises between the U.S. Department of Energy and Energy Northwest.

3.3 BREAKOUT SESSION 3: CHARACTERIZATION NEEDS AND METHODS

Objective: Identify what kinds of characterization will be required and the technologies and methods that are or will be available.

Assumptions:

1. Removal actions will take place because the ROD (EPA/ROD/R10-01/119) mandates complete removal (the ROD is based on records searches, interviews, monitoring wells, and soil gas surveys). Removal will be to 15 ft below the surface, the standard for industrial cleanup.

2. The burial ground is the source of the tritium. Data from a tritium fingerprint show that tritium is coming from the 618-11 Burial Ground, although the process for flow is unknown.

3. The following types of waste are present: RH-TRU, high-level waste (spent fuel), CH-TRU, LLW, and LLMW.

4. Some material is not contained; it may be liquids.

5. TRU and most hazardous materials have some potential to be dispersed to the environment.

6. VPUs and caissons are open at the bottom.

Given the above assumptions, participants listed the key steps on the critical path with respect to characterization, because characterization data will drive project cost and schedule. The participants next listed the set of information required from a characterization program for each of these steps.

Characterize to support the following key steps:

1. Safety analysis (What kind of health and safety checks will need to be in place?)
2. Determination of removal techniques
3. Selection of treatment, storage, and disposal
4. Demonstration of WAC compliance
5. Transportation
6. Certification that residual soils meet regulatory limits, to determine waste site boundaries.

For each of these steps, the following characterization data are needed:

1. Radiological and chemical source term
2. Volume
3. Material form and container integrity
4. Location and distribution
5. Combustibles, explosives, and dispersibles
6. Container shape and configuration
7. Backfill
8. Plume size and direction
9. Process history for the waste
10. Impact of classified material and security.

Potential Solutions

Participants then brainstormed potential solutions to attain the desired characterization data, listing existing solutions/technologies and newer technologies that may still be in development or approaches that have not been attempted yet (Table 3-8).

Table 3-8. Characterization Needs and Methods –Solutions and Technologies. (2 pages)

Existing Potential Solutions/Technologies	Related New Solutions/Technologies
∉ Records analysis ∉ Tap the lessons learned from the Waste Receiving and Processing facility sending waste to the Waste Isolation Pilot Plant and the acceptable knowledge effort	∉ Starlight software program – Program can be used for document searches, spatial data, and fact data. The program performs a mathematical analysis to verify similarity or dissimilarity to find clusters of documents that belong together. It cannot search handwritten documents. Developed by Pacific Northwest National Laboratory. ∉ U.S. Department of Defense over-flight data
∉ Geophysics (ground-penetrating radar); seismic and radiometric methods ∉ In situ gamma and neutron measurement	∉ Residual potential mapping to help with vadose zone mapping and monitoring ∉ 3-dimensional ground-penetrating radar; steel casing through waste (for gamma-gamma, passive neutron) ∉ Steel casing resistivity technology for plume detection and backfill characterization ∉ Cross-hole/trench geophysics ∉ Combination of electromagnetics and magnetics ∉ Multi-frequency electromagnetics to characterize volume, location, distribution, backfill, plume detection, and material form

Table 3-8. Characterization Needs and Methods –Solutions and Technologies. (2 pages)

Existing Potential Solutions/Technologies	Related New Solutions/Technologies
∉ Sampling/coring test pits ∉ Downhole cameras ∉ Probing into piped caissons (cameras) ∉ Soil gas sampling ∉ HNU[c]/VOCs/explosivity meters	∉ Microtunneling as an alternative to cone penetrometer technology ∉ Microgravity to characterize backfill ∉ Fiber optic video borescopes (e.g., Olympus[a] or Everest VIT's camera systems[b]) ∉ Develop a safe access "portal" that can be installed on top of the selected caissons to allow for insertion of a variety of characterization devices (e.g., cameras, radiation/chemical sensors, etc.). Could offer data with more certainty than many remote/geophysical methods
∉ Real-time characterization during excavation	∉ Cryogenic radiation detector (spectral analytical tool from the Pacific Northwest National Laboratory that measures temperature rise from each strike) ∉ "Chem Lab on a chip" – an in situ technology used by Sandia National Laboratories and Los Alamos National Laboratory that is in the process of getting certified
∉ TLD study down inside caissons ∉ Soil pH and other soil conditions that lead to corrosion ∉ Continue groundwater monitoring	∉ Literature search on technologies used to clean up hazardous waste sites, U.S. Department of Defense sites, and Homeland Security technologies (some of which currently may be classified) ∉ International technology searches ∉ National Aeronautics and Space Administration technologies using robots and probes ∉ Remote sensing, including classified technologies ∉ Environmental Management Science Program sensors, including real-time tritium detectors ∉ Geostatistics to determine how much data and where samples should be obtained (need to link decision analysis data, risk analysis) ∉ Geostatistics to map results ∉ Multispectral infrared – different heat capacities and radial capacities. Depends on time of day. Do from the air, but may not see 15 ft down

[a]Olympus is a trademark of Olympus Optical Co., Ltd., Melville, New York.
[b]Everest VIT is a trademark of Everest VIT, Inc., Flanders, New Jersey.
[c]HNU is a trademark of Process Analyzers LLC, Walpole, Massachusetts.

TLD = thermoluminescent dosimeter.
VOC = volatile organic compound.

For what activities is technology development needed?

1. Chemical source term – minimally invasive techniques are lacking. Most existing non-invasive technologies are focused on radiological contaminants.

2. Robotics for remote probe activities – Many cost-effective technologies exist in the commercial sector. In addition, the National Aeronautics and Space Administration and the Jet Propulsion Laboratory might have Mars-related robot technology. Tank removal often is done with robotics.

Recommendations:

1. Validate characterization technology at another location. Test tools for caissons in the 218-W-4B Caissons in the 200 Areas.

2. Examine dose rate records to make conservative estimates on activity level (links into geostatistics).

3. A documented safety analysis can help with the decision whether to encapsulate or suck out caissons.

4. When considering characterization for pre-treatment versus disposal, an increasing degree of sophistication is required.

5. Constantly look ahead to determine what characterization is needed next.

6. When looking at technologies, think of other organizations: U.S. Department of Defense, National Aeronautics and Space Administration, the Office of Homeland Security, EPA Superfund's hazardous waste sites, and the oil and mining industries.

7. Use geophysics with a graded approach, with a suite of tools. Geophysics could be an initial approach.

8. Two characterization strategies may be needed: one for radiological components, one for chemical contaminants.

9. Develop a simple and safe means for penetrating the top lids of caissons to allow for direct/intrusive characterization.

3.4 BREAKOUT SESSION 4: EXCAVATION NEEDS AND METHODS

Objectives: Identify the best technologies and methods for excavation at the trenches and the VPUs and caissons, and identify technical methods to minimize waste, health and safety risks, and costs while meeting characterization needs.

Excavation Needs and Methods Issues:

1. Pyramid approach to excavation
2. Excavation sequence
3. Methods of Excavation
   a. Trenches
   b. VPUs and caissons
4. Waste minimization
5. Shielding
6. Excavation equipment features
7. Area of contamination
8. Different waste streams influencing different retrieval techniques

9. Confinement
10. Meeting characterization needs
11. Remote retrieval
12. Automation
13. Fugitive emissions/dust suppression
14. Upfront characterization
15. Handling issues.

Breakout session participants represented a wide range of experience with all levels of excavation of a landfill. They advocated a pragmatic approach to excavation. Table 3-9 identifies potential solutions for each issue and associated discussion. The session ended before participants were able to discuss potential solutions for automation, fugitive emissions/dust suppression, upfront characterization, and handling issues.

Table 3-9. Issues, Potential Solutions, and Discussions Regarding Excavation Needs and Methods. (5 pages)

Issue	Potential Solution
Impacts on production rate	Pyramid approach to excavation – The excavation itself is at the top of the pyramid, while most of the effort to streamline the process must be applied to the issues at the bottom of the pyramid. Listed from top to bottom: excavation, piles based on observation, characterization, sort into waste types, containers, and disposal. See Figure 3-1 (immediately following this table).
Excavation sequence	∉ Use lessons learned from other Hanford Site burial grounds and other DOE sites. Forty to 50 burial grounds on the Hanford Site are similar to the 618 trenches and will have been excavated before the 618-10 and 618-11 Burial Grounds. These burial grounds likely will provide procedural groundwork. ∉ Operate equipment conventionally and remotely to provide for ALARA/risk of hitting TRU. If a large gamma source is discovered while the machine is in the landfill, the operator simply could be removed and excavation could continue. ∉ Build a hybrid piece of equipment with suction and magnetic capabilities, buckets, sampling tools, etc. By building considerable capability and versatility into a single unit, the project will not have to shut down when unknowns are encountered. For example, build a dipper with a bucket and vacuum system. ∉ Exercise caution when picking a “one-size-fits-all” solution. ∉ Enclose the area of contamination with a mobile tent that has a high-efficiency particulate air system. Excavation within an enclosure increases complexity exponentially, because of the potential for contamination inside the enclosure, the need to filter for contamination, and the need to manage heavy equipment.

Table 3-9. Issues, Potential Solutions, and Discussions Regarding Excavation Needs and Methods. (5 pages)

Issue	Potential Solution
Excavation sequence (cont)	∉ Excavate the 618-10 Burial Ground before the 618-11 Burial Ground. Begin excavation with trenches at 618-10, then VPUs at 618-10, then trenches at 618-11, then the VPUs and caissons at 618-11. Because 618-10 is a more benign burial ground than 618-11, it was recommended that all excavation be completed at 618-10 before excavation at 618-11 is begun. Given the proximity of 618-11 to Energy Northwest, this also would allow work teams to use lessons learned from the excavation of 618-10 to better protect Energy Northwest and the public. The sequencing allows work to start in the area with the least hazards. Ask these questions: How experienced is your crew? How good are they at working together? ∉ Consider availability of facilities and the WIPP schedule. If the M-91 facility is not ready, then the trenches should be done first. ∉ Maintain flexibility in approach. If the material in the caissons is TRU, that might modify the order of the excavation. The impact to groundwater could drive 618-11 to be done first. ∉ Use real-time instruments. ∉ Use sprays to reduce fugitives. ∉ Use soil fixatives to increase productivity and reduce cost.
Methods of excavation – trenches	∉ Excavate waste as a unit by fixing into a monolith. Transport via a sleeve and remove trench contents as a single monolith from the landfill onto the staging area, where the waste would undergo characterization and size reduction. This approach would allow parallel efforts in the trench and on the staging area, providing greater productivity. Many different grouts, fixers, rubber compounds, and wax compounds could be used to solidify units before removal. ∉ Identify potential areas in the landfill that may be problematic before excavation. ∉ Excavate sequentially to avoid uncovering large areas of the trench. ∉ Use on-board sensors to provide real-time data. ∉ Operate equipment manually; perform segregation visually and in open air. ∉ Oxidize and stabilize pyrophorics, if encountered. ∉ Consider a mobile tent structure with a high-efficiency particulate air system.
Methods of excavation – VPUs/caissons	∉ Grout with flowable fill and remove the entire VPU/caisson. INEEL is examining a similar grout (wax-fix grout). ORNL discovered the final waste form to be no longer classified as TRU once grout was introduced. If the material in the caisson is known, perhaps it could become the final waste form. Grout does not set with organic material. LANL discovered this when running grout into VPUs containing organic material, which produced a "goo" substance. Additionally, grout can be viewed as an additional contaminated material with which to deal. A further consideration when using grout is getting it into individual containers for characterization.

Table 3-9. Issues, Potential Solutions, and Discussions Regarding Excavation Needs and Methods. (5 pages)

Issue	Potential Solution
Methods of excavation – VPUs/caissons (cont)	∉ Place a seal (e.g., steel plate) under the caisson before removal. This approach controls release of soils and wastes (by putting a seal under the caisson) and requires some infrastructure. ∉ Consider removing the material and putting it aside as WIPP develops, because quick disposition may not be a necessity. However, staging of materials would have to be negotiated with regulators, who may be reluctant to accept an "interim" staging of RH-TRU for a period not clearly defined. Consider the tradeoffs of a clean site and the staging of materials vs an unclean site, caused by disposition constraints. Also, consider environmental impacts and safety concerns with staged material (bulk waste, high plutonium contamination, high dose rates). ∉ Place a sleeve over the VPU. It would be necessary to fill in the area between the sleeve and the VPU with concrete. The addition of a sleeve may shield from shine. ∉ Assess the condition of the VPUs/caissons before excavation.
Waste minimization	∉ Avoid operating equipment on clean soil. ∉ Use liners. ∉ Load waste into soft-sided sacks (called burrito bags) to store in the staging area while waiting for analytical results. ∉ Put soft waste into 55-gal drums to be disposed of later at the Environmental Restoration Disposal Facility (providing they meet the 90 percent compaction requirement).
Shielding	∉ Use staged geophysics, in particular vertical geophysics. ∉ Use shielding casks and/or portable shielding walls/barriers when removing high gamma emitters. ∉ Include in engineering design for VPUs and caissons. ∉ Use direct reading instrumentation on excavator. There is a dig face monitor for TRU that detects at 1 to 1.5 ft, provided the project is willing to allow for the counting time necessary. ∉ Consider the distance between people and source as part of the time, distance, and shielding calculation. ∉ Integrate into work and contingency planning. ∉ Have a readily deployable shield for staging.
Excavation equipment features	∉ Consider whether the equipment is for archaeological or production use and the waste streams on which it will be used. Mining equipment may provide helpful engineering ideas, because of its redundancy and the sensor equipment needed. ∉ Consider end effectors.

Table 3-9. Issues, Potential Solutions, and Discussions Regarding Excavation Needs and Methods. (5 pages)

Issue	Potential Solution
Excavation equipment features (cont)	∉ Provide for flexibility; a broad array of methods is needed to handle any abnormalities discovered in the burial grounds. Equipment should have the capability and tools to deal with off-normal events encountered in the caissons and trenches. Examples are sheers, brass for pyrophorics (does not spark), grappling tools, etc. ∉ Use a hybrid approach to provide the versatility and capability to deal with the abnormalities that could be in the trenches. ∉ Use machines equipped for both manual and remote use. If unexpected materials are encountered, keep the machine in the trench instead of backing it off immediately. ∉ Use real-time or other characterization equipment. ∉ Ensure redundancy in terms of equipment and staff. ∉ Have sound maintenance/repair plans. ∉ Provide for receiving containers for the different waste types to minimize handling.
Area of contamination	∉ Plan up front to minimize the handling of material to reduce costs. The area of contamination was not defined in the ROD, so there is great flexibility on this issue. Double handling the material increases the cost of the project. ∉ Plan a staging area two to three times larger than the actual excavation area. ∉ Build over capacity to allow for movement of equipment.
Different waste streams influencing different retrieval techniques	∉ Solutions are listed under "excavation equipment features."
Confinement	∉ Perform a risk analysis to define methods for mitigation to avoid confinement. Confinements are driven by classification of the hazard category. Weather shelters do not have the restrictions of confinements, but ventilation systems on a weather shelter can function as "confinement."
Meeting characterization needs	∉ Consider an initial separation between soils and everything else at the time of excavation. Characterization can be performed so long as it is in a quantifiable volume. There is a fundamental difference between handling soils versus other materials. Perhaps "all other materials" can be put in barrels and then taken to a secondary characterization. Eberline* has a piece of equipment that can remove overburden and separate the soils (if contamination is homogenous, it will not work). ∉ Consider the merits of incidental blending. Intentional blending to meet the waste acceptance criteria cannot be performed. However, the excavation process may include some incidental blending (e.g., perhaps a container opens during excavation, resulting in inadvertent blending of waste and soils). ∉ Identify different staging areas based on material types (drums, gloves, cardboard) and then sample. Other considerations: All material will have to be unpacked to be WIPP certified. High-activity anomalous waste streams and low-activity anomalous waste streams go to two different places.

Table 3-9. Issues, Potential Solutions, and Discussions Regarding Excavation Needs and Methods. (5 pages)

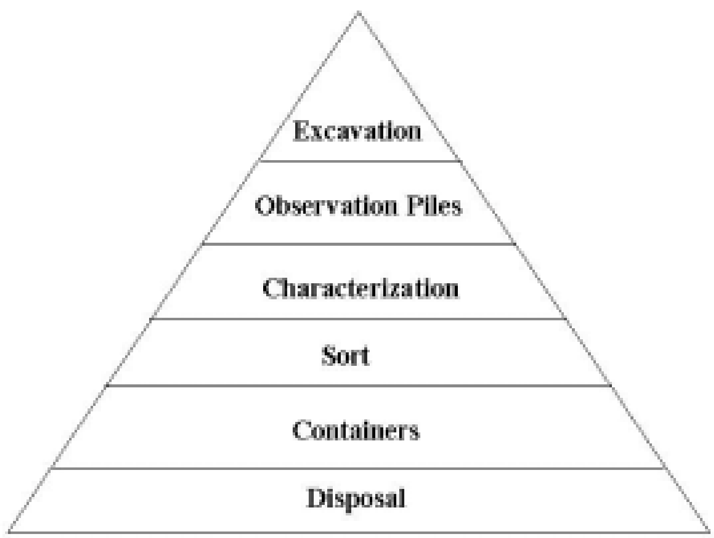
Issue	Potential Solution
Remote retrieval	∉ Consider tradeoffs between manual labor versus automation, including cost and exposure, productivity, quantity, and duration. Having both capabilities in place prepares the excavator for the potential hazards in the area. Other consideration/question: ALARA mandates that high-level waste be excavated with remote systems. A single piece of equipment could be operated manually and remotely. Why not go solely remote?

* Eberline is a trademark of Eberline Instruments, a subsidiary of Thermo Electron Corporation, Waltham, Massachusetts.

ROD = EPA/ROD/R10-01/119, *Interim Action Record of Decision for the 300-FF-2 Operable Unit*.

ALARA = as low as reasonably achievable.
DOE = U.S. Department of Energy.
INEEL = Idaho National Engineering and Environmental Laboratory.
LANL = Los Alamos National Laboratory.
ORNL = Oak Ridge National Laboratory.
RH = remote-handled.
TRU = transuranic.
VPU = vertical pipe unit.
WIPP = Waste Isolation Pilot Plant.

Figure 3-1. Pyramid Approach to Excavation.



Other Topics of Discussion

1. Production rates for equipment in the hole doing removal will be driven by the rate of processing waste after the fact. The mitigating factor is how to stage the waste, such as soil staging areas, or using the M-91 facility and T Plant as a way to store that material. The minimization of waste should be addressed in proper planning, which takes into account excavation, sorting methods, and characterization.

2. The handling of waste can be streamlined after excavation by using a segmented gate system to identify up front what soil will go to WIPP or back into the landfill as backfill.

3. A direct reading on the excavator will be crucial for characterization and to define initial disposition of containers.

4. When and how will the decision be made to go remote? How can abnormal events in trenches be addressed? How can considerable thought be put into the whole system up front, so as not to adversely affect productivity and schedule?

5. Reduce emissions by using agents in the waste and soil to knock down contamination that might get offsite.

6. Valid ground-penetrating radar results (soil characterization results) are necessary to delineate high, medium, or low risks.

3.5 BREAKOUT SESSION 5: TREATMENT, STORAGE, AND DISPOSAL TECHNICAL ISSUES

Objective: Identify technical issues and constraints regarding the methods used to treat the waste and where to store and dispose of it, and identify technical strategies/technologies to address those issues.

Issues for Treatment, Storage, and Disposal

1. Sorting facility
2. Need for storage before treatment, storage, and disposal
3. Pathway to disposal
4. Orphan waste (waste for which there is no pathway to disposal)
5. Expect surprises with wastes; treatment of plume with Energy Northwest nearby
6. WAC for all waste types; treatment of uranium
7. Pretreatment options for trenches
8. Treatment, storage, and disposal for classified material.

There appear to be two types of waste from a worker health and safety perspective:

- RH-TRU will be sorted remotely, in a shielded facility, and possibly also size-reduced. Lots of debris with high dose rates likely exists in the caissons and VPUs

- Waste from trenches – covered in soils, in boxes, or paint cans, is more accessible and possibly can be handled onsite.

Tri-Party Agreement Milestone M-91 requires a facility for TRU waste treatment and packaging by 2013. This could involve retrofitting an existing building at the Hanford Site or building a new facility. This decision will impact storage, treatment, and disposal of waste from the 618-10 and 618-11 Burial Grounds, so close coordination is recommended. The 618-10 and 618-11 Burial Grounds project should plan for the possibility that a removal action may be required before the M-91 facility is available.

As with other breakout session topics, characterization emerged as a primary issue, because the qualities of the excavated waste affect how it is retrieved, sorted, stored, treated, and disposed. It may be best to do sorting and size reduction in the field, perhaps including some kind of stabilization process to make removal easier, before moving waste from burial grounds to storage or disposal facilities. WAC are in place at the Hanford Site to deal with most of the waste types. WAC still are being developed for WIPP (ready by 2005) and Yucca Mountain (ready by 2011), so by the time remediation of the 618-10 and 618-11 Burial Grounds begins, those WAC should be in place. Even though there are unknowns, disposition pathways do exist.

Sorting, Treatment, Storage, and Disposal Needs for Each Waste Type

Potential locations for sorting, treatment, storage, and disposal were identified for each of the waste types that may be found in the 618-10 and 618-11 Burial Grounds, as outlined in Tables 3-10 and 3-11.

Table 3-10. Sorting, Treatment, Storage, and Disposal Needs for Each Waste Type. (2 pages)

Waste Type	Sorting	Treatment	Storage	Disposal
LLW	--	Super-compaction may be needed to meet the ERDF WAC (BHI-00139) for density of LLW	--	ERDF if meets density requirement
Classified LLW	--	--	--	Nevada LLW burial trench may be able to accept this waste
Greater than Class C LLW	--	Grout/high-integrity container	--	To two onsite LLMW trenches if in high-integrity container or grouted.
LLMW	--	∉ Thermal treatment at ATG or disposal at ERDF ∉ For MW debris: macroencapsulation ∉ MW acids: neutralization ∉ MW free liquids: stabilization	--	∉ Commercial offsite facility if meets LDR ∉ Onsite trenches at ERDF with treatment to meet WAC.
CH-TRU	Onsite sorting facility needed. Assay technology needed to detect TRU vs non-TRU	Size reduction, remove liquids, stabilize at WRAP If RH-TRU were mixed with CH, it all would have to be sorted and treated as RH-TRU.	CH-TRU – if goes through WRAP, check on size limitations and what the nondestructive assay equipment can handle in terms of weight and box size. Does WRAP only ship waste in drums?	WIPP (except corrosives, ignitables, and reactives)
RH-TRU	Onsite sorting facility needed	Coordination needed with M-91 facility	--	WIPP (except corrosives, ignitables, and reactives). WIPP will have WAC for RH-TRU by 2005.
Classified TRU	--	--	--	WIPP

Table 3-10. Sorting, Treatment, Storage, and Disposal Needs for Each Waste Type. (2 pages)

Waste Type	**Sorting**	**Treatment**	**Storage**	**Disposal**
TRU with PCBs	--	No free liquid	--	WIPP (WIPP just completed a TSCA permit for TRU with PCBs; still working on modification to RCRA permit)
Non-TRU with PCBs	--	--	--	LLW burial grounds or to ERDF with treatment
Spent fuel	Will spent fuel fragments be considered RH-TRU or spent fuel?	Treatment may be needed to put into dry storage Spent fuel treatment is waste-dependent	Dry storage onsite	Yucca Mountain (Yucca WAC in 2011).
Pyrophorics (Na, Na-K, U, Zr)	--	∉ Oxidation ∉ Controlled reactions to form potassium carbonate ∉ Make into NaOH that could be treated with tank waste at the vitrification plant ∉ Coordination needed with whatever Fast Flux Test Facility builds for its treatment facility.	--	Onsite mixed waste burial grounds (may require treatment as CERCLA generated waste)
Uranium	--	No treatment required	--	Three facilities at the Hanford Site accept untreated uranium: ERDF, LLW burial grounds, US Ecology.
VOCs	--	In situ thermal treatment	--	--

BHI-00139, *Environmental Restoration Disposal Facility Waste Acceptance Criteria.*
Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.
Toxic Substances Control Act of 1976, 15 USC 2601, et seq.

ATG = Allied Technology Group
CH = contact-handled.
ERDF = Environmental Restoration Disposal Facility.
LDR = land disposal restriction.
LLMW = low-level mixed waste.
LLW = low-level waste.
MW = mixed waste.
PCB = polychlorinated biphenyl.
RCRA = *Resource Conservation and Recovery Act of 1976.*
RH = remote-handled.
TRU = transuranic.
TSCA = *Toxic Substances Control Act of 1976.*
VOC = volatile organic compound.
WAC = waste acceptance criteria.
WIPP = Waste Isolation Pilot Plant.
WRAP = Waste Receiving and Processing.

Table 3-11. Potential Solutions to Issues Regarding Sorting, Treatment, Storage, and Disposal Needs. (2 pages)

Issues	Potential Solutions
Sorting facility	• Waste profiling should be done up front; screen out debris; treat onsite (e.g., macroencapsulation) • Conduct preliminary records searches to build expectations of what containers contain TRU or non-TRU and then do pre-sorting with equipment during excavation • Assay technology needed to detect TRU versus non-TRU • Consider doing sorting and size reduction work in the field before moving off the burial ground areas • Shielded facility to sort and size reduce RH-TRU • Define instrumentation needs/onsite laboratory • Onsite sorting needed for CH-TRU and RH-TRU • Field screening (e.g., segmented gate) • Treat each scoop as bounding waste, then use nondestructive assay to confirm TRU • M-91 facility (B Plant, PUREX, Fuels and Materials Evaluation Facility, T Plant)
Need for storage before treatment, storage, and disposal	• Explore regulatory flexibility for treatment and storage • M-91 decision on T Plant, B Plant, etc. • Combine storage with sorting facility • Monitored retrievable storage (short term vs long term) • Central Waste Complex – However, the Site is attempting to avoid providing long-term waste storage in facilities such as the Central Waste Complex. • Coordinate with other programs onsite because they may be vying for the same space
Pathway to disposal	• See Table 3-10 for disposal pathways for each waste type • Integration needed with rest of the Site's activities having waste • Integration needed with excavation, transportation, and packaging
Orphan waste (wastes without defined disposal pathways)	• Develop or enhance/adapt treatment technologies • Coordinate with onsite and offsite projects that also encounter orphan waste • Explore regulatory flexibility (waiver to use other facility) • Consider monitored retrievable storage • Determine whether spent fuel fragments will be classified as RH-TRU or spent fuel. Check DOE O 435.1 (the old DOE Order was explicit about how to distinguish). Also, check on the precedents at the K Basins.
Expect surprises with wastes	• See orphan waste solutions listed above • Develop treatment contingency plans • Coordinate with onsite and offsite programs regarding the contingency plan • Ensure that contingency plan is linked to the health and safety plan and safety authorization basis • Develop or enhance/adapt treatment technologies • Include flexibility in equipment – lots of tools in toolbox • Include stabilization technologies in plans • Ensure adequate storage capacity
WAC for all waste types	• WAC are in place at the Hanford Site to deal with most of the waste types • WIPP will have final WAC for RH-TRU by 2005 • Yucca Mountain may have WAC for spent fuel in 2011

Table 3-11. Potential Solutions to Issues Regarding
Sorting, Treatment, Storage, and Disposal Needs. (2 pages)

Issues	Potential Solutions
Treatment, including pretreatment options for trenches and treatment of the tritium plume near Energy Northwest	∉ Do treatment by waste stream ∉ Use lessons learned and experiences from the other 40 to 50 landfill sites at the Hanford Site that will be dealt with before the 618-10 and 618-11 Burial Grounds ∉ Coordinate with the M-91 facility on RH-TRU ∉ Coordinate with Waste Receiving and Processing facility regarding throughput capacity ∉ Consider in situ (or ex situ) vitrification of the trench and then removal; provides stabilization, reduces engineering cost, and can increase human health and safety ∉ Grouting ∉ Treat to meet WAC or treat for removal ∉ Make airborne releases less likely by using aerosol techniques of putting water on the dig or injecting additives (waxes) ∉ Consider passive/active treatment of tritium plume to reduce further migration ∉ Consider bioremediation technologies to treat organic waste (however, note that bioremediation takes time and may cause more problems with increased corrosion and releases from leaching) ∉ Investigate presence of microorganisms that currently thrive in the burial ground soil environment and consider using for bioremediation
Classified material	∉ Get it declassified ∉ Have someone with clearance do a records inventory search ∉ Check requirements to resize or reshape classified materials in the trench ∉ Put controls up front ∉ Have Security searching for classified items over video (live with potential for tapes if viewing is required within a certain timeframe)
Impacts on performance assessment	∉ The performance assessment for the low-level burial grounds (DOE/RL-2000-72) has been completed, and one also exists for ERDF (BHI-00169). Performance assessments must be updated every five years. If waste exceeds certain levels, an internal assessment is required. Coordination is needed to ensure that this project's waste streams do not trigger the performance assessment

BHI-00169, *Environmental Restoration Disposal Facility Performance Assessment.*
DOE O 435.1, *Radioactive Waste Management.*
DOE/RL-2000-72, *Performance Assessment Monitoring Plan for the Hanford Site Low-Level Burial Grounds.*

CH = contact-handled.
ERDF = Environmental Restoration Disposal Facility.
PUREX = Plutonium-Uranium Extraction.
RH = remote-handled.
TRU = transuranic.
WAC = waste acceptance criteria.
WIPP = Waste Isolation Pilot Plant.

Additional Discussion

One participant commented that there is a potential for TRU mixed waste to be an orphan waste because of differences among DOE, WIPP, and RCRA definitions and the fire codes for structures. Fire codes define corrosivity as erosivity on skin, while RCRA measures corrosivity differently.

A breakout session participant expressed concern regarding the short-term perspective of the site and this workshop. It is the longer term materials, such as uranium, that most highly concern offsite stakeholders. There must be strong plans to deal with surprises and enough flexibility in the approach to deal with those surprises.

Treatment of the tritium plume near Energy Northwest will be done by source removal and natural attenuation. A separate groundwater ROD (EPA/ROD/R10-96/143) exists for this plume, and EPA conducts five-year reviews of those decisions. If quarterly monitoring indicates that the plume has become more of a problem, action will be taken. The risk of this plume, in addition to the major tritium plume moving toward the Columbia River, is the issue. This is a little plume inside the larger Sitewide tritium plume.

3.6 BREAKOUT SESSION 6: TRANSPORTATION AND PACKAGING

Objective: Identify the technical issues and constraints for packaging and transportation of the wastes, and identify technical strategies/technologies to address them (Table 3-12).

Table 3-12. Transportation and Packaging Issues and Potential Solutions. (3 pages)

Issues	Potential Solutions
Characterization	∉ Consider using APL mobile vendors onsite and offsite. Available onsite laboratories include 222-S analytical rad laboratory, and WSCF for low rads and chemicals. APLs can be set up at the site depending on how operations are arranged. There is some required infrastructure (phone lines, computers, etc.). ∉ Use the Central Certification Facility as a backup option. Key issue that defines disposal methods, packaging, and shipping. ∉ Determine activity per drum by nondestructive assay. ∉ Use suites of screening tools, including gamma camera, weight, and an onsite mobile laboratory to provide a quick screen for next path or basic waste characterization to get into interim packaging. ∉ Use X-ray methods to determine whether shielding is present. If so, assume RH-TRU is present. ∉ Take head gas sampling. ∉ Perform real-time assay for solids on conveyor. ∉ Given the low expected volume of TRU, it might be better to do confirmation elsewhere.
Packaging	∉ Default to most restrictive packaging. Consider increased cost and transportation complications when defaulting to most restrictive packaging. ∉ Do not reinvent the wheel unless there are unique requirements. Use WIPP's packages, if sending waste to WIPP. Many types of DOT-compliant packaging have gone through certification. If it can fit by size or volume reduction into an existing package, try that first. TRUPACT-3 will be available in 2005. It currently is undergoing testing. TRUPACT-2 is available for CH-TRU. Interior packaging, including 72s and 160s, can be used for RH-TRU and placed inside 55-, 85-, or 10-gal drums (called overpacks). TRUPACT limitations exist offsite, but not onsite. ∉ Containers should be as large as possible. If trucks are used, weight is a limitation unless special haulers are built. The design-build fabrication process can be time consuming and expensive. Railcars are able to hold more weight.

Table 3-12. Transportation and Packaging Issues and Potential Solutions. (3 pages)

Issues	Potential Solutions
Packaging (cont)	∉ Show pre-design for packages to the recipient and NRC at least 18 months ahead of the desired shipping date. A new type of packaging can take a year of design to develop. The approval process can run parallel to the design but it must start immediately. Packaging variances can be obtained, if permits are sought. ∉ Be aware that WIPP is considering alternative packaging for RH-TRU (overpacks, sleeves over pipes). Currently, WIPP cannot take an overcased and retrieved VPU as an intact unit without characterization. ∉ Ensure that what is packaged and shipped meets WAC; conduct verification at the point of packaging. A person with a pair of binoculars watching from a distance can verify the events that occur during videotaping. This way, re-opening a package can be prevented in case material is placed incorrectly. In addition, a video is proof that it meets WAC. ∉ Stabilize with Pyrofoam,* air bladder, non-reactive goo, or high-density polyethylene. ∉ Use the interim and alternative approach: verify packaging in the field before it reaches the disposal point. ∉ Consider that more packaging flexibility exists onsite than offsite. The offsite waste packaging requirements need to comply with DOT and NRC. Onsite waste packaging requirements can go three pathways, as outlined in DOE/RL-2001-36: full equivalent route, which is to comply with DOT and NRC; modified route, which is a site-specific safety demonstration equivalent to DOT and NRC regulations; and risk-based approach, which is not equivalent to DOT and NRC. Currently, all three pathways are practiced at the Hanford Site. The fully equivalent route is the preferred method. If not, a modified route is the best option, but the package must remain onsite. The risk-based approach means that requirements are met from an engineering standpoint or that probability for hazard is below established thresholds.
Size and volume reduction	∉ Options include shredding, baling, cryo-compaction, thermal treatment, and macro- and micro-encapsulation. Shredding can grow volume – it depends on sorting capability. Shredding does give uniform sizing, so you can deal in a standard methodology for sorting. It takes unique shapes out of the equation. Shredding and compacting provide a smaller package. Cryo-compaction freezes and breaks all materials and stays compacted. ∉ A VPU would have to be cut off if it is too long to fit in TRUPACT. Assuming the entire length of the VPU is not full, the top section would be cut off and capped to reduce the length to fit in the cask. ∉ Investigate the potential to automate sorting and repackaging processes. ∉ Soil washing (may generate more waste). ∉ Thermal coating; Environmental Alternatives Incorporated performs thermal coating (technology demonstration at LANL and West Valley). ∉ Pull out metals as a way to reduce volume.
Throughput	∉ Conduct in situ field analysis. Bring a mobile facility to the dig site for quick turnaround and quick screening information. ∉ Less automation is better (WIPP finding). Robotics can prevent fast throughput with TRU. Robotics are a high-cost system for a potentially small waste volume. ∉ Screen/segregate early in the process to maximize throughput and safety.

Table 3-12. Transportation and Packaging Issues and Potential Solutions. (3 pages)

Issues	Potential Solutions
Truck vs rail	∉ Use the onsite open rail system operated by the DOE. This system provides flexibility for moving heavy and long pieces of equipment not able to be size reduced (could move to M-91 facility for further processing). Rail may be good for the bulk of solids that are excavated, i.e., soil going to ERDF (use railcar and tipper system). ∉ Consider shielding benefits. A railcar can be shielded more easily than a package on a road. ∉ If shipping to WIPP, rail currently is not an option but could become an option in the future. The option is discussed in the WIPP *Transuranic Waste Performance Management Plan* (Carlsbad 2002), but is not promising. Railcars are not as efficient as trucks. To ship from Idaho to WIPP by truck roundtrip takes 10 days (including loading); by rail it is 60 to 90 days. There are efficiency and political issues associated with rail. States currently cannot perform inspections on rail as they do for trucks.
Coordination	∉ Coordinate railcar activities. Fluor Hanford has started scheduling all waste shipments; this helps allocate equipment and personnel to ensure maximum throughput and flexibility. For TRU, there is an entire system totally scheduled, tracked, and managed. Shipments have to be on a schedule 8 weeks in advance. Once there is notification that a package is characterized and ready to move, a shipper/driver/transport rig is assigned and coordination takes place at the point of receipt. ∉ Keep the Hanford Advisory Board informed.
Security	∉ Be aware of classified items in transport and have correct personnel and packaging in place. ∉ Follow the chain of custody. ∉ Involve the Office of Safeguards and Security; have them investigate activities in the 300 Area. ∉ Records searches may declassify some items.
Local public access	∉ Restrict access to excavation sites. This requires careful planning, given the proximity to major public access roads. ∉ Take roads out of "in-commerce" use after hours for onsite shipping. Procedures exist for this type of process. This requires coordination with fire, police, and Energy Northwest. It takes three days to set up a road closure. If it can be done on a shift schedule, it can eliminate overtime costs (with patrols, drivers, etc.). ∉ Abide by packaging standards when transporting material "in commerce" (under DOT or NRC regulation).
Investigated derived waste (waste generated by the project)	∉ Investigate exemptions. Exemptions are available for transportation processes (packaging and labeling). This helps cut down on some paperwork and potential exposures.
Certification of old drums	∉ Observe condition and conduct comparative analysis. ∉ Consider using overpack drums. ∉ To ship retrieved drums in TRUPACT, must have a certified 7a container.

* Pyrofoam is a trademark of Pyrofoam Inc., Kennewick, Washington.
Carlsbad, 2002, *Transuranic Waste Performance Management Plan*.
DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*.

APL	=	acceleration process line.	RH	=	remote-handled.
CH	=	contact-handled.	TRU	=	transuranic.
DOE	=	U.S. Department of Energy.	TRUPACT	=	transuranic package transporter.
DOT	=	U.S. Department of Transportation.	VPU	=	vertical pipe unit.
ERDF	=	Environmental Restoration Disposal Facility.	WAC	=	waste acceptance criteria.
LANL	=	Los Alamos National Laboratory.	WIPP	=	Waste Isolation Pilot Plant.
NRC	=	U.S. Nuclear Regulatory Commission.	WSCF	=	Waste Sampling and Characterization Facility.

4.0 REGULATORY, TRIBAL, AND STAKEHOLDER FEEDBACK AND CONCERNS

At the end of the workshop, regulators, tribes, and stakeholders were given an opportunity to provide feedback on the technical issues and concerns with the 618-10 and 618-11 Burial Grounds remedial design. This section summarizes the comments made during that time.

4.1 U.S. ENVIRONMENTAL PROTECTION AGENCY

Mike Goldstein, EPA, believed that the meeting had been a great success with a good exchange of ideas and lessons learned. He identified a few key results: areas of agreement regarding the conceptual remediation approach; key questions to be addressed before developing the remedial design and baseline; and data gaps that can be filled during the lengthy planning period, which provides an opportunity to focus energy and resources in the near term. Two important observations made during the workshop were that TRU retrieval can be done safely and that disposal locations will exist for any waste generated by this project.

With a forecast start date of 2013, a lengthy planning horizon exists for this project. However, that start date is somewhat arbitrary, based on other priorities at the Hanford Site. The time between now and 2013 can be used to plan, and it is anticipated that this workshop will produce momentum. Acceleration of these projects still is a possibility. EPA carefully monitors groundwater at these burial grounds, and if it is ever deemed unacceptable to wait until 2013, cleanup will accelerate; the DOE must be prepared for that possibility.

Mike discussed the drivers for remediation of these burial grounds. The 1988 NEPA ROD for 618-11 (53 FR 12449) and a 2001 CERCLA decision for both sites (EPA/ROD/R10-01/119) call for removal, treatment, and disposal of the wastes. In addition, the stakeholders will not allow the Tri-Parties and the DOE to forget about these burial grounds. Mike personally reviewed all comments on the ROD (EPA/ROD/R10-01/119) and has written many responses on the 618-10 and 618-11 Burial Grounds. He offered to share his perspective as a regulator with any interested stakeholders. Another reason cleanup will happen is that there was a major release from these burial grounds to the groundwater. Although only a small quantity of tritium escaped, it was at high concentrations.

This workshop was great as a first start, but it is just a start. EPA is cautiously optimistic and hopes the momentum continues. Mike thanked all participants and organizers for their hard work.

4.2 WASHINGTON STATE DEPARTMENT OF ECOLOGY

Fred Jamison, Waste Management Project Manager for the Washington State Department of Ecology (Ecology) Nuclear Waste Program, supported Mike Goldstein’s points regarding the areas of opportunity. Ecology’s Waste Management program focuses on permitting and regulatory oversight of Hanford Site waste treatment, storage, and disposal activities. The program is devoted to safety, collaborating on waste treatment, and environmental remediation, especially long-term protection of the environment.

The Tri-Party Agreement governs a broad range of waste management and cleanup activities and serves as the framework for collaborating among the Tri-Party Agreement agencies. The agencies are interested in advancing Hanford Site cleanup work, including new and effective approaches. Workshops help provide grounding in addressing the work.

Ecology is most interested in understanding how cleanup will result in reduced risk, a clean environment, and long-term stewardship. Ecology is interested in outcomes and thus needs clarity regarding the content in areas such as characterization, remedial actions, land use, groundwater impacts, contaminated cleanup, and waste disposal. Technology, products, and lessons learned should be the basis for these areas. Ecology will continue to coordinate the regulatory actions needed to protect workers and the environment and to satisfy Federal and state regulations.

Dib Goswami, Ecology, is Ecology's primary technical expert for Hanford Site groundwater and vadose zone concerns. He also is the Ecology point of contact for the U.S. Department of Energy, Environmental Management (EM-50). He attended some of the breakout sessions and commented that the workshop went very well, beyond his expectations. He believes that the workshop successfully put planning on the path forward for a specific remedial plan and enforcement commitments from the DOE.

Dib strongly supports technology demonstration projects. The groundwater already is contaminated and there has been a release from the burial grounds; those are major issues for the public and stakeholders. He noted that the EM-50 budget has decreased drastically during the last three years. Given the high expense of treating TRU, it may be a challenge to convince EM-50 or Congress to provide the kind of budget needed for characterization and remediation activities.

The groundwater strategy developed through the C3T process (Cleanup Challenges and Constraints Team, a collaboration among the Tri-Party Agreement agencies to improve cleanup efforts) identified a policy of "do no harm," which he urged planners to keep in mind.

Characterization emerged as a key issue in all the workshop sessions, given the many unknowns in these burial grounds. The Tri-Party Agreement agencies will have to consider those unknowns when developing enforceable milestones. Some issues discussed in the workshop currently are being addressed by the Tri-Party Agreement agencies, as an outcome of the C3T process.

4.3 ENERGY NORTHWEST

John Arbuckle, Energy Northwest, noted that the license to operate the Columbia Power Generating Station will expire in 2023, but Energy Northwest intends to apply for a 20-year extension, so the plant will be operating during remediation activities. Energy Northwest's key concerns are an emergency plan and communications. John will continue to work with

Kevin Leary and Larry Hulstrom on these issues. It is important to continue to include Energy Northwest in planning for remediation activities.

Some specific ideas are to link the 618-10 and 618-11 Burial Grounds into the *Memorandum of Understanding Between Energy Northwest and the U.S. Department of Energy, Richland Operations Office for Emergency Preparedness and Response* (MOU); ensure that methods are in place for notification between the DOE and Energy Northwest; define ways of notifying alerts; define response requirements, evacuation routes, and assembly areas; and coordinate emergency response training and drills. Other areas for consideration include planning for potential impacts on Columbia Generating Station operations; security; environmental monitoring; and area infrastructure.

Questions

Question: Was the 618-11 Burial Ground ever a risk factor in the licensing of the Columbia Generating Station?
Response: John Arbuckle explained that it was not initially a concern during the licensing process, although there were discussions later with the U.S. Nuclear Regulatory Commission (NRC) regarding the burial ground. For example, in response to a public comment regarding the nearby location of the 618-11 burial site, the NRC concluded that the radioactive wastes stored underground, or activities at the site, could not affect any potential accident sequences at the Columbia Generating Station or the consequences of an accident (NUREG-0812, *Final Environmental Statement Related to the Operation of WPPSS Nuclear Project No. 2*).

Question: Is there any mention in the existing *Columbia Generating Station Emergency Plan* for the burial grounds?
Response: Although it is not specifically identified in the *Columbia Generating Station Emergency Plan* at this time, any emergency associated with the 618-11 Burial Ground currently would be addressed as part of the MOU on planning and response to emergencies at the Hanford Site. The 618-11 Burial Ground also was evaluated for its potential impact on the Columbia Generating Station as part of the *Columbia Generating Station Final Safety Analysis Report* (FSAR). The FSAR mentioned that the site was stabilized in 1983 and that the ground-monitoring well was added in 1995. Because the site was stabilized (essentially “inert”), the FSAR concluded that there were no credible hazards or hazardous events that would impact the Columbia Generating Station. As part of the remediation plans for the 618-11 Burial Ground, the potential impacts would have to be revisited and the FSAR and *Columbia Generating Station Emergency Plan* would be updated accordingly.

4.4 STATE OF OREGON

Dirk Dunning, State of Oregon, echoed the comments of EPA and Ecology. He emphasized that the 618-10 and 618-11 Burial Grounds are extremely difficult sites and deserve the kind of effort that most DOE sites are receiving.

The State of Oregon’s interest in the Hanford Site stems from (1) concern over protection of the Columbia River and flows between the river and groundwater under the Hanford Site; (2) transportation, because almost everything going to and from the Site passes through Oregon and two Oregon counties are within the Site's 50-mi emergency planning zone; and (3) support for the efforts of the Confederated Tribes of the Umatilla Indian Reservation, some of whom are citizens of Oregon.

Regarding protection of the Columbia River, Dirk asked the DOE how certain it is about what has happened historically on the Site and emphasized the need for current cleanup efforts to be protective. He pointed out that through oral histories, the Tribes remember the glacial flood when the Hanford Site region was under 500 ft of water, which had huge impacts on the geology of the Site and how groundwater flows. This oral history is in contrast to the history of the Hanford Site. During the Site's years of secrecy, Dirk's uncle was the #6 badge person on the site, yet there is no oral history in Dirk's family of what happened on the Site. The DOE does have documents that recorded the history, but many of those records were disposed of and lost. There are many other events of recent history related to the burial grounds that Dirk fears have been forgotten, such as (1) the late 1950s flood of the Columbia River that threatened the City of Richland and triggered the city to build a seawall; although Richland was saved from flooding, portions of the 300 Area were not; and (2) activities in the 300 Area produced many types of wastes and isotopes, but records of those activities are not good. Dirk listed several points regarding history and activities in the 300 Area of which project planners should be aware.

Planning for contingencies is crucial. Proper engineering has to do with design, which should be robust and elegant. Dirk observed that many workshop participants had warned RL not to "over-engineer" and cautioned them to recognize the difference between robust engineering and overly conservative engineering.

Dirk ended his comments with the observation that the 300 Area used the 618-10 and 618-11 Burial Grounds for disposal in the interest of protecting workers. Today, those very burial grounds are a problem. He urged the DOE to thoroughly think through its remedial plans and do the solution once to ensure that history does not repeat itself.

4.5 NEZ PERCE TRIBE

Gabe Bohnee is an environmental specialist for the Nez Perce Tribe and an enrolled member. The Nez Perce Tribe is listed as a tribe affected by the Hanford Site. The *Treaty with the Walla Walla, Cayuse and Umatilla 1855* ceded Tribal lands that are now part of the Hanford Site, so the Tribe monitors activities that affect those lands and the Columbia River.

Recognizing that the 618-10 and 618-11 Burial Grounds had been pushed to the side, Gabe is glad to see money available to work on these areas. The lack of records is a huge issue to the Tribe, which wants to ensure that current records are adequate for future reference. He urged project planners to keep good records for protection of water and resources in the area. The Tribe also wants excavated materials going to good monitored and retrievable storage.

Regarding groundwater, the Tribe has difficulty dealing with the operable unit division between groundwater and the vadose zone. It is not acceptable to the Tribe to sacrifice water, so this division does not make sense. Recognizing that there is only an interim ROD for the 618-10 and 618-11 Burial Grounds (EPA/ROD/R10-01/119), the Tribe sees the possibility to change this.

The Nez Perce Tribe has been on this land since time immemorial, inhabiting and using areas they loved. Pointing out that water is becoming scarce in the western United States because of pollution and increasing populations, Gabe asked the DOE to consider how it calculates the value of the water. Do the volumes of water under the Hanford Site get included in a cost-benefit analysis?

4.6 WANAPUM TRIBE

Lenora Seelatsee spoke on behalf of the Wanapum Tribe at Priest Rapids. The Wanapum Tribe makes an effort to attend these meetings and to monitor cleanup activities. Lenora reported that she learned a considerable amount from the workshop. The Wanapum have several sites on the Hanford Site. Rex Buck, Lenora’s brother, frequently is on the Hanford Site with the tribal Elders. The Elders are concerned because of the equipment and changes.

Lenora’s grandfather has been working with the DOE for many years and remembers being escorted with machine guns to visit different sites. The Wanapum have been worried about the site, lands, animals, water, and plants. The Tribe believes in prayer and will keep working with people, just as it worked with the U.S. Army during the Manhattan Project. The Tribe works with the other agencies and tribes as well and will continue to do so, because that is how they were taught by the Elders.

The Wanapum believe that the land does not belong to them to keep or give away; it is for everybody, so the Tribe works with everybody. It is teaching the younger generation about these issues. There are many things people do not understand. Lenora’s grandfather and grandmother saw things for which they didn’t have English words, and now Lenora sees those things. Waste has a lot to do with the environment and the lands.

4.7 GROUNDWATER PROTECTION PROGRAM

Dick Wilde, Fluor Hanford, thanked Kevin Leary and Larry Hulstrom for organizing a good workshop. He acknowledged the good representation from throughout the DOE Complex.

At the December 2002 Hanford Advisory Board meeting in Portland, Oregon, Dick presented his vision of the Groundwater Protection Program. There are difficult decisions coming in the next few years, and RL and Fluor Hanford want public input on those decisions well in advance of the NEPA, CERCLA, and RCRA paperwork. He promised to have these kinds of workshops on issues, years in advance of the decisions. This workshop was the first; a workshop on N Springs tentatively is scheduled for August 11, 2003, on how to move the project from interim pump-and-treat operations to the final remedy in the next few years. Dick invited anyone interested in groundwater protection and participating in the decision-making process to attend the next workshop.

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5.0 CONCLUSIONS AND PATH FORWARD

The workshop concluded by recapping general areas of agreement, key planning assumptions, questions (see the Executive Summary), and next steps.

The project team applauded the great ideas generated at this workshop and anticipates that the lessons learned and information sharing was mutually beneficially. Information from the presentations, breakout sessions, and plenary sessions will be compiled into a summary and distributed to registered attendees (see Appendix C). A program will be developed using the workshop information as a basis, and contacts made at the workshop will be developed as the project progresses.

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6.0 REFERENCES

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priorities List," Title 40, *Code of Federal Regulations*, Part 300, as amended.

53 FR 12449, "Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington; Record of Decision (ROD)," *Federal Register*, Vol. 53, pp. 12449 ff, April 14, 1988.

ASME NQA-1-2000, 2000, *Quality Assurance Requirements for Nuclear Facility Applications*, American Society of Mechanical Engineers, New York, New York.

BHI-00139, 2002, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, Rev. 4, Bechtel Hanford, Inc., Richland, Washington.

BHI-00169, 1995, *Environmental Restoration Disposal Facility Performance Assessment*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

Carlsbad, 2002, *Transuranic Waste Performance Management Plan*, U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico.

Columbia Generating Station Emergency Plan, Energy Northwest, Richland, Washington.

Columbia Generating Station Final Safety Analysis Report, Energy Northwest, Richland, Washington.

Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 USC 9601 et seq.

DOE O 413.3, *Program and Project Management for the Acquisition of Capital Assets*, U.S. Department of Energy, Washington, D.C.

DOE O 435.1, *Radioactive Waste Management*, U.S. Department of Energy, Washington, D.C.

DOE/EIS-0113, 1987, *Final Environmental Impact Statement for Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes*, U.S. Department of Energy, Washington, D.C.

DOE/RL-2000-72, 2000, *Performance Assessment Monitoring Plan for the Hanford Site Low-Level Burial Grounds*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-36, 2002, *Hanford Sitewide Transportation Safety Document*, Rev. 0-A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/WIPP-02-3122, 2002, *Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Project*, Rev. 0.1, U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico.

DOE/WIPP-02-3214, 2003, *Remote-Handled TRU Waste Characterization Program Implementation Plan*, Rev. 0B, U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington, as amended.

EPA/ROD/R-10-93/070, 1993, *EPA Superfund Record of Decision: Idaho National Engineering Laboratory (USDOE), EPA ID: ID4890008952, OU 18, Idaho Falls, ID, 09/24/1993*, (Record Of Decision - Declaration For Pit 9 At The Radioactive Waste Management Complex Subsurface Disposal Area at the Idaho National Engineering Laboratory, Idaho Falls, Idaho, October 1993), U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA/ROD/R10-96/143, 1996, *EPA Superfund Record of Decision: Hanford 300-Area (USDOE), EPA ID: WA2890090077, OU 01, 02, Benton County, WA, 07/17/1996*, (Record of Decision for the 300-FF-1 and 300-FF-5 Operable Units, July 1996), U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA/ROD/R10-01/119, 2001, *EPA Superfund Record of Decision: Hanford 300-Area (USDOE), EPA ID: WA2890090077, OU 03, Benton County, WA, 04/04/2001*, (Interim Action Record of Decision for the 300-FF-2 Operable Unit, April 2001), U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

Memorandum of Understanding Between Energy Northwest and the U.S. Department of Energy, Richland Operations Office for Emergency Preparedness and Response, 2000, Energy Northwest and U.S. Department of Energy, Richland Operations Office, Richland, Washington, September.

NM4890139088-TSDF, 2002, *Waste Isolation Pilot Project Hazardous Waste Facility Permit*, New Mexico Environment Department, Santa Fe, New Mexico, November.

NUREG-0812, 1981, *Final Environmental Statement Related to the Operation of WPPSS Nuclear Project No. 2*, U.S. Nuclear Regulatory Commission, Washington, D.C.

Price-Anderson Amendments Act of 1988, Pub. L. 100-408, Aug. 20, 1988, 102 Stat. 1066.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.

Toxic Substances Control Act of 1976, 15 USC 2601, et seq.

Treaty with the Walla Walla, Cayuse and Umatilla 1855, 12 Stat. 945, June 9, 1855, Ratified March 8, 1859, Proclaimed April 11, 1859.

APPENDIX A

WORKSHOP ATTENDEES

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APPENDIX A
WORKSHOP ATTENDEES

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AEA Tech = AEA Technology Engineering Services, Inc.
BBWI = Bechtel B&W Idaho.
BNFL = British Nuclear Fuels, Limited.
BWXT = BWX Technologies, Inc.
CTUIR = Confederated Tribes of the Umatilla Indian Reservation.
DOE = U.S. Department of Energy.
DOE-HQ = U.S. Department of Energy-Headquarters.
DOE-ID = U.S. Department of Energy-Idaho.
DOE-NETL = National Energy Technology Laboratory.
EPA = U.S. Environmental Protection Agency.
INEEL = Idaho National Engineering and Environmental Laboratory.
LANL = Los Alamos National Laboratory.
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APPENDIX B

618-10 AND 618-11 BURIAL GROUNDS BACKGROUND BRIEFING PACKAGE FOR REMEDIAL DESIGN WORKSHOP JUNE 9-12, 2003

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APPENDIX B

618-10 AND 618-11 BURIAL GROUNDS BACKGROUND BRIEFING PACKAGE FOR REMEDIAL DESIGN WORKSHOP JUNE 9-12, 2003

B1.0 WORKSHOP OBJECTIVE

The 618-10 and 618-11 Burial Grounds Remedial Design Technical Workshop will gather technical experts from several U.S. Department of Energy (DOE) sites, academia, and industry who have experience in dealing with buried waste containing transuranic (TRU) elements. A vendor poster session at the onset of the workshop will feature several potential innovative technologies that might be considered for aspects of the burial ground remediation, as a means to stimulate creative and “out-of-the box” thinking during the workshop. Workshop discussions will focus on sharing lessons learned and identifying issues and potential solutions for waste characterization, excavation methods, stabilization techniques for removal and handling, retrievability and segregation, packaging and transportation, health and safety issues, treatment requirements, final disposal, and compliance with regulatory requirements. The information shared during the workshop also will benefit other DOE sites with similar problems. The results of the workshop will be documented in a final report and incorporated into a revision of a master schedule for remedial actions for these burial grounds.

B2.0 SITE HISTORY

B2.1 618-10 BURIAL GROUND

NOTE: Figures B-1 through B-8, located at the end of this appendix, show the location and details of the two burial grounds.

- The burial ground operated from 1954 to 1963. The site is approximately 5.7 acres, located approximately 3.7 km (2.3 mi) west of the Columbia River.

- The site was surface stabilized with the addition of 2 to 4 ft of fill and crested wheatgrass in 1983 and contains low- to high-activity waste (primarily fission products and some TRUs) from the 300 Area.

- The site consists of trenches of various sizes and vertical pipe units (VPU) (five bottomless 55-gal drums welded together). Three unplanned releases are associated with the operation of the burial ground.

- Twelve trenches mainly were used for disposal of low-level waste. Some other high-activity waste was placed in concrete-shielded drums and buried in the trenches.

- Potential contaminants include uranium, plutonium, fission products, other TRU constituents, and petroleum products.
- Estimates indicate there are approximately 98,000 m^3 (127,000 yd^3) of waste with about 8.4 m^3 (11 yd^3) of remote-handled (RH) TRU, although the actual quantity of waste disposed of is unknown.
- Ninety-four of the VPUs were used for disposal of high-activity waste.
- In 1961, a fire destroyed the flammable materials in one trench.
- During the 1983 stabilization, oil puddled to the surface (trench 4 near marker 3-64-55) indicating the breach of a container and the presence of liquids.
- Waste types include radiologically contaminated laboratory instruments, bottles, boxes, filters, aluminum cuttings, irradiated fuel element samples, metallurgical samples, electrical equipment, lighting fixtures, barrels, laboratory furniture, and low- and high-level liquid waste sealed in containers. Trenches received low-level waste in cardboard boxes. Materials with higher dose rates were packaged in cement barrels and disposed of in the trenches. Small high-activity wastes were put into the VPUs.

B2.2 618-11 BURIAL GROUND

- The burial ground operated from 1962 to 1967. The site is 8.6 acres, located approximately 5.8 km (3.6 mi) west of the Columbia River.
- The site was covered with 4 ft of soil after it was closed in 1967. The site was surface stabilized in 1983 with an additional 2 ft of fill and crested wheatgrass.
- The burial ground received low- to high-activity dry wastes, fission products, plutonium, and other TRU constituents in a variety of waste forms.
- TRU wastes are those containing concentrations greater than 100 nCi/g of radioactive elements with atomic numbers greater than uranium. This includes plutonium, americium, curium, and neptunium.
- Historical information has identified contaminants of concern to include uranium, cesium, strontium, curium, cobalt-60, zirconium, plutonium metal, and plutonium nitrate.
- Estimates indicate that there are 102,000 m^3 (134,000 yd^3) of waste with approximately 94 m^3 (123 yd^3) of RH-TRU and about 10,200 m^3 (13,350 yd^3) of contact-handled (CH)-TRU, although the actual quantities of waste disposed of is unknown.
- Other contaminants might include thorium, beryllium, aluminum-lithium (a possible component of tritium target materials), carbon tetrachloride, hydrogen gas (probably a misnomer for tritium), and sodium-potassium eutectic.

- Some elements of the buried inventory are chemically reactive in water and in air and could, under the right conditions, become pyrophoric.
- The 300 Area was used for fuel fabrication, research and development activities (pilot-scale tests) supporting the development of processes used in the 200 Area (e.g., Plutonium-Uranium Extraction), and other activities such as those developed in the Plutonium Recycle Test Reactor facility. Wastes from these facilities were buried at the 618-10 or 618-11 Burial Grounds, or at burial grounds in the 200 Areas. Exact inventory records are limited and often contradictory.
- The burial ground consists of 3 trenches, each 900 by 50 by 25 ft deep; 50 VPUs; and up to 5 large-diameter caissons. Seven unplanned releases are associated with the operation of the burial ground.
- In DOE/EIS-0113, *Final Environmental Impact Statement for Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes*, the alternative selected in 53 FR 12449, "Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington; Record of Decision (ROD)," was to proceed with the removal and processing of waste from the 618-11 Burial Ground.
- Timeline of activities at the 618-11 Burial Ground:
  - Operations were conducted from 1962 to 1967.
  - The Pacific Northwest National Laboratory conducted studies in 1978.
  - DOE/EIS-0113 and 53 FR 12449, issued in 1987 and 1988, respectively, called for excavation, removal, and processing of the waste from the burial ground.
  - At the direction of the U.S. Environmental Protection Agency and Washington State Department of Ecology, an expedited response action was evaluated in 1992 and 1993. Increased monitoring was chosen.
  - In 1995, a new well (699-13-3A) was installed down gradient of the burial ground to monitor groundwater as part of *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA) activities.
  - A January 1999 sampling event reported that tritium was in the groundwater.

B3.0 SITE DESCRIPTION

The trenches received primarily CH and low-activity radioactive waste from 300 Area operations, solid wastes such as laboratory cardboard cartons, some concrete drums containing higher activity wastes, and contaminated soils from releases in the 300 Area.

VPUs received RH or high-activity wastes. Each VPU consisted of five 55-gal drums welded end for end and stood vertically. Records are unclear as to whether they were capped on the bottom, sitting on concrete foundations, or open to the soil.

Caissons at the 618-11 Burial Ground are 2.4 m (8-ft) diameter metal pipe, 3 m (10 ft) long, buried vertically 4.6 m (15 ft) below grade, connected to the surface by offset 91.4 cm (36-in.) diameter pipe with a dome-type cap. All VPUs and caissons were capped with concrete and covered with dirt as they were filled.

Annual surface radiation surveys are conducted and indicate no releases at the surface.

Burial Ground 618-10 has the following disposal units:

- 94 VPUs
- 12 trenches.

Burial Ground 618-11 has the following disposal units:

- 50 VPUs
- 4 or 5 caissons (references have conflicting information)
- 3 trenches.

NOTE: **VPUs** may contain segments of irradiated fuel elements in “cans” and other high-activity waste. The VPUs are 22 in. in diameter, 15 ft long, and set 10 ft apart with concrete covers and concrete footings. **Caissons** contain metal cans of high-activity waste and have an angled pipe leading into the actual caisson that is 8 ft in diameter by 10 ft in height with the angled pipe (3 ft diameter) having a domed cap with a concrete plug. **Trenches** mostly contain low-level waste possibly with some drag-off burial concrete boxes that contain high-activity waste. At the 618-10 Burial Ground, trenches vary from 320 ft by 70 ft, by 25 ft to 50 ft long, by 40 ft wide, by 25 ft deep. At the 618-11 Burial Ground, the trenches are 50 ft wide by 900 ft long and 12 to 15 ft deep, with 4 ft of soil cover that was placed there in 1983.

B4.0 ENVIRONMENTAL IMPACTS AND RISK

Travel time from the burial grounds to the Columbia River varies from 3 to 30 years. The tritium plumes from the 200 Areas affect groundwater sample results down gradient. The 618-11 Burial Ground has a localized plume of tritium that is 400 times the drinking water standard (8.1 million pCi/L). Other potential impacts and risks include potential exposure to Energy Northwest power plant employees and DOE contractors and subcontractors during remediation, RH-TRU waste that has contact doses of up to 500R/h, the potential presence of pyrophoric waste (sodium-potassium metals reactive with water and potential ignitable metals uranium and zirconium), inhalation of beryllium, and the potential exposure to unknown waste. A preliminary risk assessment for human health and ecological risks was conducted in DOE/RL-99-40, *Focused Feasibility Study for the 300-FF-2 Operable Unit*.

(See contents of the *Interim Action Record of Decision for the 300-FF-2 Operable Unit, April 2001* [300-FF-2 OU ROD] [EPA 2001] pertinent to the 618-10 and 618-11 Burial Grounds below for additional information as well as "issues.")

B5.0 REGULATORY AND PUBLIC PERCEPTION/INVOLVEMENT

Regulators and stakeholders have a high level of interest in the planning and prioritization involving the remediation of the 618-10 and 618-11 Burial Grounds. In a February 27, 2002, letter from the Oregon Office of Energy to Chris Smith of DOE regarding their comments on the 100/300 Areas Change Packages, they were glad to see the addition of interim Milestones M-016-66 (due September 30, 2004, for Initiating the Intermediate Design and Authorization Safety Analysis) and M-016-67 (due March 21, 2007, for Submitting an Intermediate Design Report, Remediation Schedule, and a Treatability Investigation Work Plan) for the 618-10 and 618-11 Burial Grounds. The letter also stated that the delay of 11½ years between the start of the remedial action design (March 21, 2007) and completion of the remediation (September 30, 2018) is excessive and recommended this time frame be accelerated. A letter from the Hanford Advisory Board, dated February 8, 2002, to Klein, Iani, and Fitzsimmons, commented on the important relationship between the completion of the M-91 activities and the remediation of the 618-10 and 618-11 Burial Grounds. (M-91 refers to a series of milestones that related to creation of a facility for storage, treatment, and processing of TRU wastes.) The letter further stated that remediation of these two burial grounds is a critical part of the Hanford Site cleanup program and that M-91 should be adequately funded. In a March 6, 2002, public meeting in Hood River, Oregon, discussing the negotiation packages for the River Corridor and Central Plateau accelerated cleanup, the consensus of the public was that an accelerated cleanup schedule for the 618-10 and 618-11 Burial Grounds should be pursued.

B6.0 REMEDIAL ACTION OPTIONS

(See also contents of the 300-FF-2 OU ROD [EPA 2001] pertinent to the 618-10 and 618-11 Burial Grounds below for additional information.)

B7.0 COST ESTIMATES, BUDGET, AND SCHEDULE

B7.1 REMEDIAL ACTION COST ESTIMATES

- Rough order of magnitude cost estimates from the 300-FF-2 OU ROD (EPA 2001): 618-10 Burial Ground – $38.24 million and 618-11 Burial Ground – $331.3 million

- Rough order of magnitude cost estimates from CCN 098537, “Preliminary Cost Estimate and Project Level Schedule for 618-10 and 618-11 Burial Grounds,” for the trenches only: 618-10 Burial Ground – $33.1 million and $317.8 million for the 618-11 Burial Ground. Cost estimates are based on two assumptions: (1) the soils around the VPUs and caissons are non-contaminated; and (2) the waste in the VPUs and caissons for the 618-10 Burial Ground is 90 percent low-level mixed waste (LLMW) and 10 percent RH-TRU, and for the 618-11 Burial Ground, it is 100 percent RH-TRU.
  - 618-10 Burial Ground Costs:
    - Trenches--$33.1 million
    - VPUs--$16.6 million
    - Total--$49.7 million
  - 618-11 Burial Ground Costs:
    - Trenches--$317.8 million
    - VPUs and caissons--$20.4 million
    - Total-- $338.2 million
  - Total Costs = $387.9 million.

B7.2 SCHEDULE

- **June 30, 2002 –** Establish dates for completion of 300 Area Remedial Actions (*Hanford Federal Facility Agreement and Consent Order* [Tri-Party Agreement {TPA}] Milestone M-16-03A). This milestone was successfully completed with the acceptance of the milestones indicated below.

- **Fiscal Year (FY) 2002 –** Determine technology gaps and regulatory evaluation, and revise cost and schedule estimates. This work has been completed.

- **FY 03- FY 05 –** Generate an Authorization Safety Basis document, conduct remedial design workshop, initiate technology development project, and initiate Conceptual/Remedial Design.

- **September 30, 2004 –** Initiate intermediate design and authorization safety analysis (TPA Milestone M-016-66).

- **March 31, 2007 –** Submit an intermediate design report, a remedial action schedule, and a treatability investigation test plan (TPA Milestone M-016-67).

- **September 30, 2018 –** Complete all 300 Area remedial actions (TPA Milestone M-016-00B).

B8.0 PROJECT STATUS

Contents of the 300-FF-2 OU ROD Pertinent to the 618-10 and 618-11 Burial Grounds (from DOE/RL-99-40)

- The document refers to TPA Milestone M-16-03A, which includes establishing a schedule and milestones for remediation plans for the 618-10 and 618-11 Burial Grounds by June 30, 2002. (Completed)

- Appendix A is a summary of site knowledge, potential contaminants, and remediation costs (618-10 Burial Ground – $38.2 million and 618-11 Burial Ground – $331.3 million).

- Section VII-Table 3 – Human Health Risk; Predicted Risk (reasonable maximum exposure) present a risk greater than 1×10^{-2}, which is based on a qualitative baseline risk assessment; a quantitative baseline risk assessment will be performed to support the final ROD.

- The document includes discussions on (1) cleanup levels for each contaminant of concern, and the basis for these levels; and (2) potential land and groundwater uses.

- Table 5 of the document presents soil cleanup levels for chemical constituents, and Table 6 presents soil cleanup levels for radionuclides. Depth of excavation is presumed to be to the bottom of the burial ground.

- The following four remedial alternatives were identified: no action (alt. 1); remove, treat, and dispose (RTD) (alt. 2); modified containment (alt. 3); and containment (alt. 4). The State of Washington, stakeholders, and Tri-Parties preferred alternative 2 (RTD).

- TRU waste will be removed from the burial grounds and disposed of at the Waste Isolation Pilot Plant (WIPP). Characterization, packaging, and processing of CH-TRU will be conducted at the Waste Receiving and Processing (WRAP) facility, and RH-TRU at the future M-91 facility. If an RH-TRU facility is not constructed pursuant to the M-91 milestone, one will have to be built to support this remedial action. Exhumation is not anticipated until sometime after 2010; however, the project must be completed by the M-16-00B Milestone date of September 30, 2018.

- Groundwater use and drilling are prohibited (except for monitoring or remediation uses) as part of the present-day and cleanup period institutional controls.

- Total cost estimates for RTD, implementation of institutional controls, and groundwater monitoring for the two burial grounds is $369.5 million (present-day value).

B8.1 WORK COMPLETED TO DATE

- Limited field investigation for the 300-FF-2 Operable Unit (April 1997)

- Investigation of tritium in groundwater near the 618-11 Burial Ground initiated (January 2000)
- DOE/RL-99-40, *Focused Feasibility Study for the 300-FF-2 Operable Unit* (June 2000)
- DOE/RL-99-53, *Proposed Plan for the 300-FF-2 Operable Unit* (June 2000)
- Explanation of significant difference for DOE/RL-95-73, *Operation and Maintenance Plan for the 300-FF-5 Operable Unit* (June 2000)
- Declaration of the Record of Decision (ROD) for the 300-FF-2 Operable Unit (EPA 2001)
- 300-FF-2 Remedial Design initiated for a limited number of sites (excluding the 618-10 and 618-11 Burial Grounds) (October 2001)
- Detailed records search that includes classified information
- Technology Baseline (Gap Analysis) that includes a technology need in the former TRU-Mixed Waste Focus Area Technology Development Sub-Group
- Preliminary Hazards Classification and Basis for Interim Operations (in process)
- Bimonthly TRU benchmarking conference calls.

B9.0 ISSUES, RECOMMENDATIONS, AND PATH FORWARD

The following is a list of some of the major regulatory, technical, and logistical issues involved in the future remediation of the 618-10 and 618-11 Burial Grounds.

B9.1 ISSUES

- The 618-11 Burial Ground is adjacent to an active commercial facility (Energy Northwest) parking lot that is expected to operate for the next 50 years. This may present a significant risk to the workers and a liability to Energy Northwest.
- Energy Northwest (directly adjacent to the 618-11 Burial Ground) uses groundwater from wells 699-13-A and 699-13-B (unconfined aquifer) for reactor secondary cooling water. Wells ENW-32 and 699-13-1C (confined) are backup drinking water supply wells for the Energy Northwest facility.
- Worker safety is an issue because of the presence of RH-TRU, high-activity waste, potential pyrophoric waste (sodium-potassium metals reactive with water and potential ignitable metals uranium and zirconium), inhalation of beryllium, and the potential exposure to unknown waste.

- Methods to characterize RH-TRU need to be developed or improved. A document search shows that at the 618-10 Burial Ground, wastes with contact doses of up to 500 R/h were disposed at the site. Higher activity wastes generally were stored in the VPUs; however; some RH-TRU waste also is believed to have been disposed to the trenches.

- Retrieval of waste will require the development of several remote handling and on-site containment systems. These technologies must be developed and fully operational by 2012.

- Facilities must be available for storing, characterizing, and packaging the wastes that go to WIPP (e.g., RH-TRU waste totally depends on getting the M-91 facilities fully operational).

- Types of containers need to be evaluated.

- Limitations the future RH-TRU WIPP WAC may have on the overall project are unknown, because the WIPP WAC is due for completion in about 1 year.

- The safety analysis will be complex and may need to address criticality issues.

- Limited records were kept, with some of the burial records being destroyed. In addition, the cost estimates have not considered special precautions that must be taken with Energy Northwest still operating; therefore, cost estimates are a rough order of magnitude. Potential escalating remediation costs may have numerous adverse impacts on other Hanford Site activities.

- The 618-11 Burial Ground contains about 5 to 10 kg of TRU waste dispersed throughout the waste site; the 618-10 Burial Ground has 1 to 2 kg of TRU waste. In addition, the 618-10 Burial Ground also contains high-activity waste and buried drums of oil. In 1983, oil appeared after heavy equipment drove over the burial ground, indicating a loss of drum integrity.

- If containment (leave waste in-place with a surface barrier) were considered a viable option, this option would require substantially more on-site characterization work, which would significantly increase the potential for worker exposure.

- Because the burial grounds are south of the Wye Barricade, transportation issues may develop relative to types and numbers of shipments and the potential for road closures.

- The type and amount of characterization needed, even before shipping the waste to the M-91 facility, need to be resolved.

- Minor issues include coordination with the 200 Area TRU program, waste shipment scheduling with WIPP, and coordination of waste streams with DOE/EIS-0286D2, *Revised Draft Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement*.

- Treatment of liquid wastes needs to be resolved.

B9.2 RECOMMENDATIONS AND PATH FORWARD

- Lessons-Learned:
  - Visit Idaho National Environmental and Engineering Laboratory (INEEL) and interview personnel involved in the Pit 9 remediation. An analysis comparing the 618-11 Burial Ground to Pit 9 has been previously prepared.
  - Interview former and current employees who were involved with the two disposal facilities during operation.
  - Use bottled or compressed air (from 618-4 Burial Ground remediation).
  - Use straight-edged versus toothed bucket (from 618-4 Burial Ground remediation).
  - Ensure the contractor and subcontractor have and implement a well-defined employee concern program (from 618-4 Burial Ground remediation).
  - Keep all employees well-informed on the results of anomalous waste samples.
- Coordinate extensively with the Carlsbad Field Office in formulating the upcoming WIPP RH waste acceptance criteria, which will allow some flexibility in waste characterization, packaging, and shipping. This activity has the potential for some very large cost savings.
- Evaluate the potential of having a mobile vendor that can handle RH-TRU waste for characterization and re-packaging. Another potential option is a modular facility that is easily decontaminated and relatively easy to assemble and disassemble. Another possibility is to evaluate the feasibility of storing the RH-TRU waste at a facility (e.g., the Central Waste Complex or T Plant) until the M-91 facility is completed.
- Evaluate the potential for using rail as the primary mode of transport on site.
- Initiate the research and development of a robotics project that can perform remote nondestructive assay/nondestructive examination, size/volume reduction, retrieval, repackaging, and drum venting.
- Evaluate the potential for in-situ vitrification followed by a slurry of material that will form a reactive, artificially created attenuation barrier (e.g., flyash, zeolite and clino clays, etc.).
- Conduct a formal benchmarking exercise by performing the following:
  - Assemble a multi-disciplinary technical team to perform a preliminary feasibility study. Include one member from INEEL who was intimately involved in Pit 9.

– Perform a formal benchmarking exercise and evaluate globally similar projects. Encourage and reward creative, innovative thinking. Use information from current and past designs as well as mistakes and successes (e.g., lessons learned). Evaluate the feasibility of the preferred remediation alternative on a bench-scale level to significantly reduce costs, detect design flaws and errors, and detect operational challenges before field deployment. Complete field-scale tests in a “cold” environment before project deployment.

B10.0 SUMMARY

Innovative thinking, coupled with good coordination with the regulators and stakeholders, is essential to this project to avoid the actions of Idaho’s Pit 9. Numerous technical challenges exist as well as challenges regarding the health and safety of those workers involved in the remediation process. In addition, there are health and safety challenges and logistical problems in dealing with personnel from the adjacent Energy Northwest Nuclear Power Plant. Excessive project costs, in conjunction with current budgetary constraints and schedule constraints due to the lack of an M-91 facility, make this project appear insurmountable. However, with execution of good project management skills, this remediation project can and will be a complete success.

B11.0 REFERENCES FOR ADDITIONAL INFORMATION

Since discovery of tritium in groundwater underneath the 618-11 Burial Ground in 1999, numerous documents have been generated to describe the tritium plume (Table B-1). Before the discovery, several other documents were published that related to activities associated with the 618-10 and 618-11 Burial Grounds. Attachment 1 provides a partial compilation of the documents generated to date that relate to these burial grounds.

Ongoing efforts to monitor groundwater around both of these burial grounds are addressed in DOE/RL-95-73. During late FY 2002, as a result of finding tritium in the groundwater underlying the 618-11 Burial Ground, the regulators requested an investigation of the status of groundwater underlying the 618-10 Burial Ground. A soil gas study similar to that conducted at the 618-11 Burial Ground was performed. The final report on this activity is being completed. In early 2003, two new groundwater monitoring wells were installed down gradient of the burial ground to supplement the existing monitoring network. Sampling of these wells is identified as part of the scope of DOE/RL-95-73.

In parallel with these activities, efforts have been conducted during the past two years to initiate remedial design activities that support the 300-FF-2 ROD (EPA 2001), which was issued in April 2001. These documents and/or letter reports are identified in Attachment 2.

In June 2002, DOE/RL-2001-47, *Remedial Design Report/Remedial Action Work Plan for the 300 Area*, and DOE/RL-2001-48, *300 Area Remedial Action Sampling and Analysis Plan*, were issued. As part of the scope for FY 2003, this document will be revised to include a discussion of the baseline schedule for remedial actions planned for the 618-10 and 618-11 Burial Grounds. This draft schedule, which was discussed in CCN 098537, is included for information as Attachment 3.

In addition to the revision of DOE/RL-2001-47, the work scope for FY 2003 includes initiating safety basis documentation to comply with the requirements of 10 CFR 830, "Nuclear Safety Management," and hosting a workshop in June 2003. This workshop will be conducted to gather technical experts from onsite and offsite who have experience in dealing with waste containing TRU elements. Elements to be discussed include excavation methods, stabilization techniques, retrievability and handling, characterization, packaging and transportation, safety, treatment requirements, final disposal, and compliance with regulatory requirements. The results of the workshop will be documented in a final report and incorporated into a revision of a master schedule for remedial actions for these burial grounds.

In parallel with these FY 2003 work scope items, additional interest is being shown from DOE-Headquarters for initiating some technology development activities through the Office of Science and Technology Alternative Technology Development program. A proposal, which includes evaluation of RH-TRU waste removal and delineation technologies for the 618-10 and 618-11 Burial Grounds, has been approved and is in the solicitation process as of May 1, 2003.

The U.S. Department of Energy, Richland Operations Office contact for soil remedial action activities is Kevin Leary (509-373-7285), and the contact for groundwater-related items relative to these burial grounds is Mike Thompson (509-373-0750).

Larry Hulstrom
Fluor Hanford
Groundwater Protection Program
618-10 & 618-11 Burial Grounds Task Lead
(509) 373-3928

Figure B-1. Location of the 618-10 and 618-11 Burial Grounds.

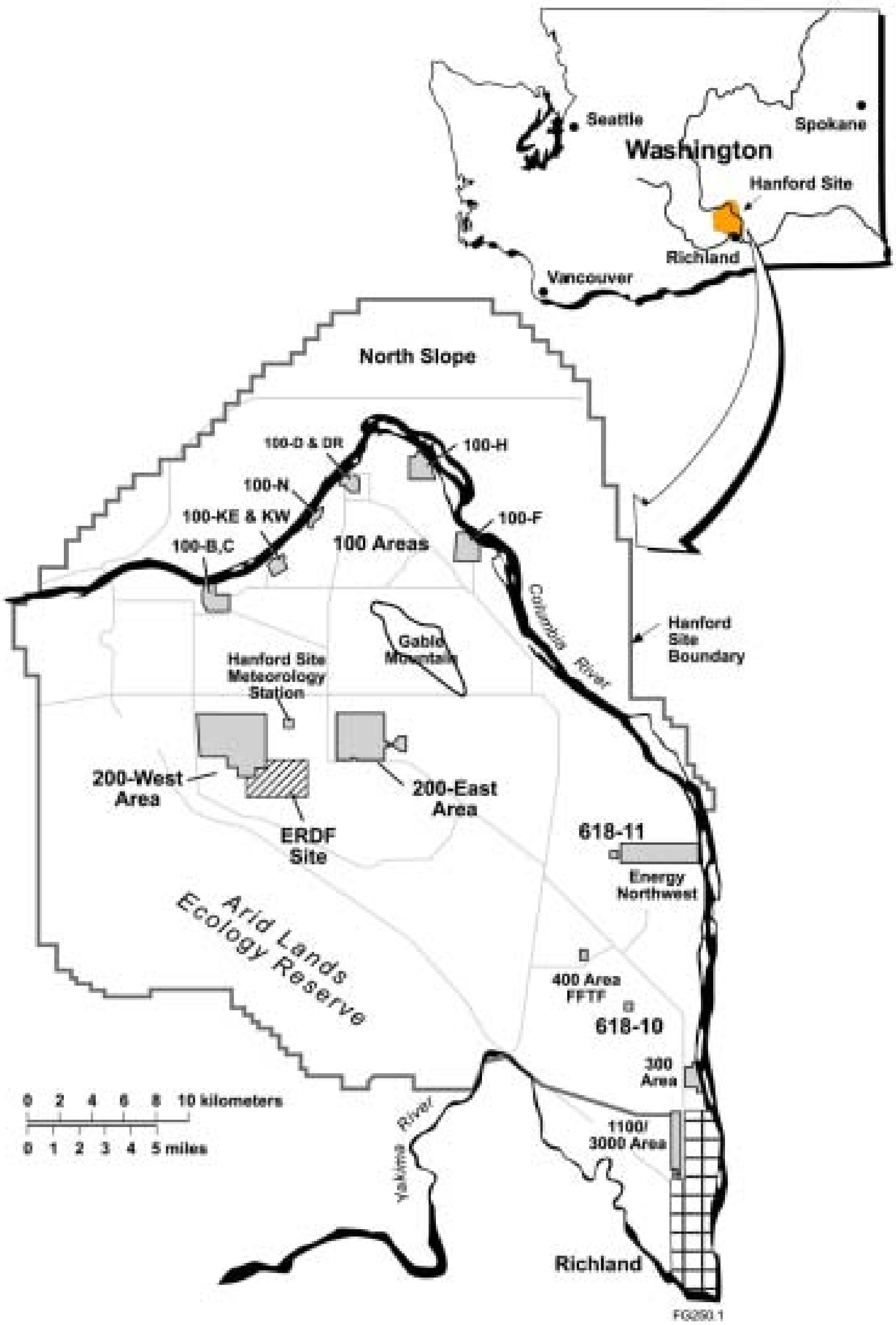


Figure B-2. 618-10 Burial Ground (1983 after Surface Stabilization).

Figure B-3. The 618-10 Burial Ground.

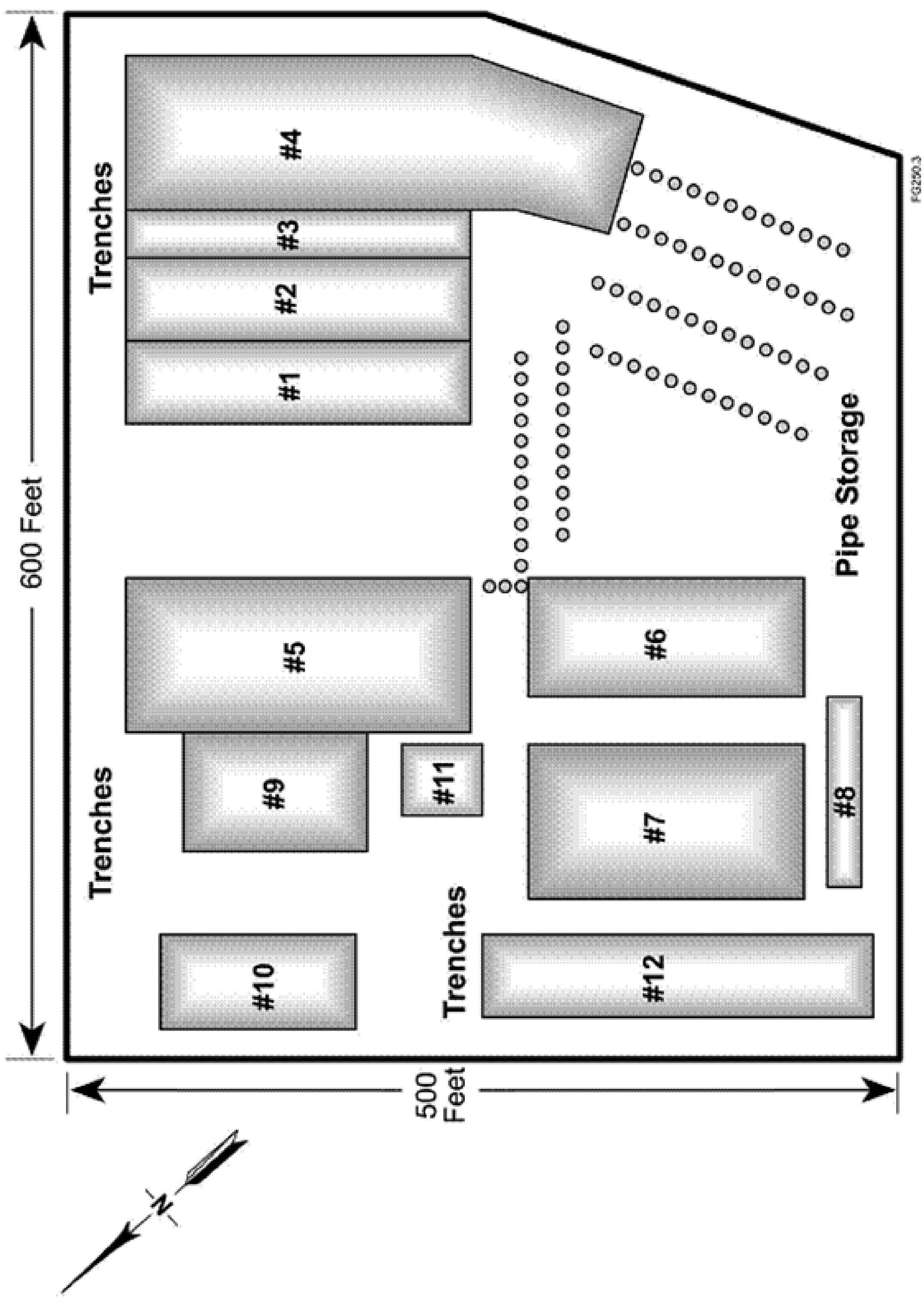


Figure B-4. A 618-10 and 618-11 Burial Ground Vertical Pipe Unit.

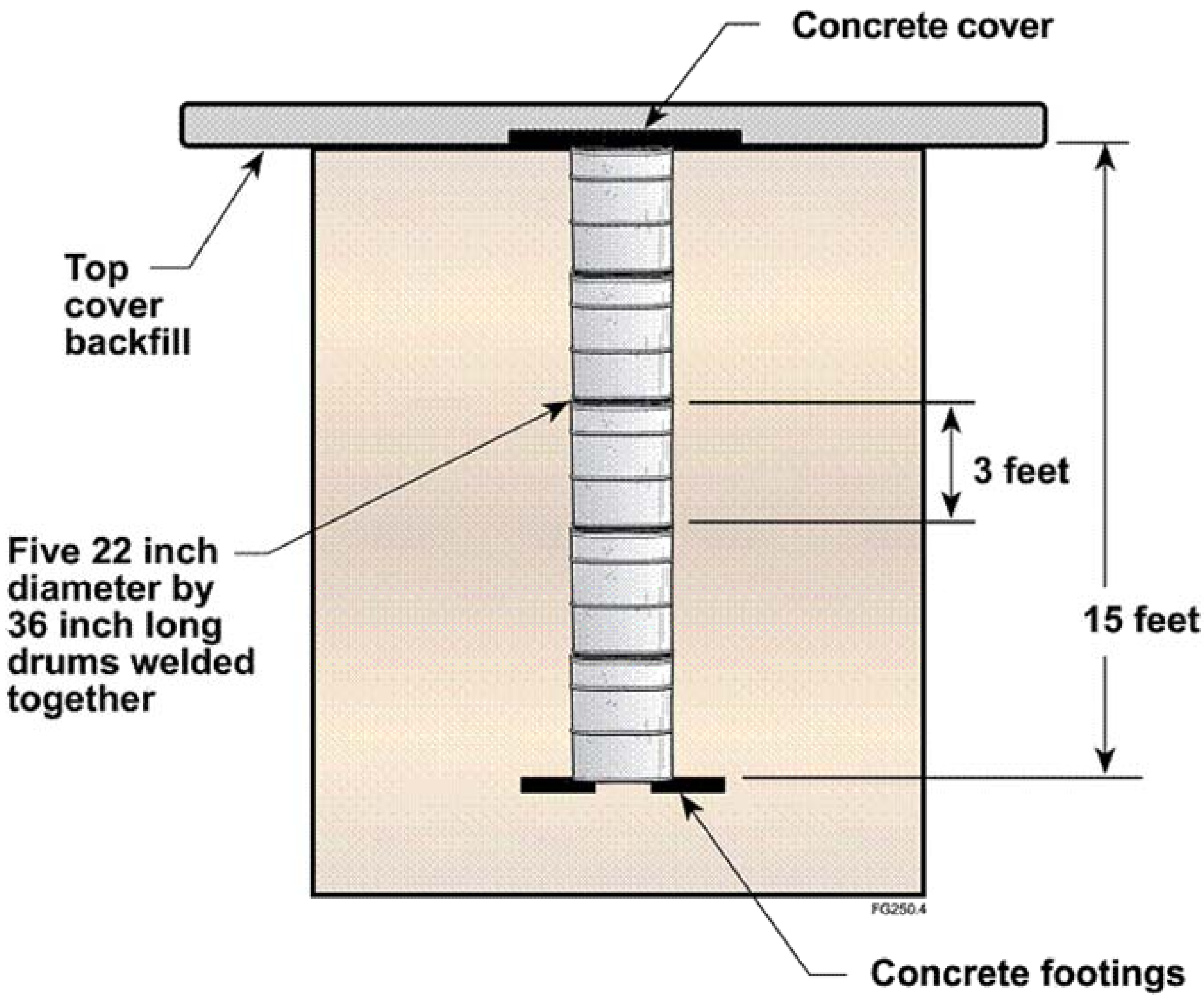


Figure B-5. The 618-11 Burial Ground in 2002.

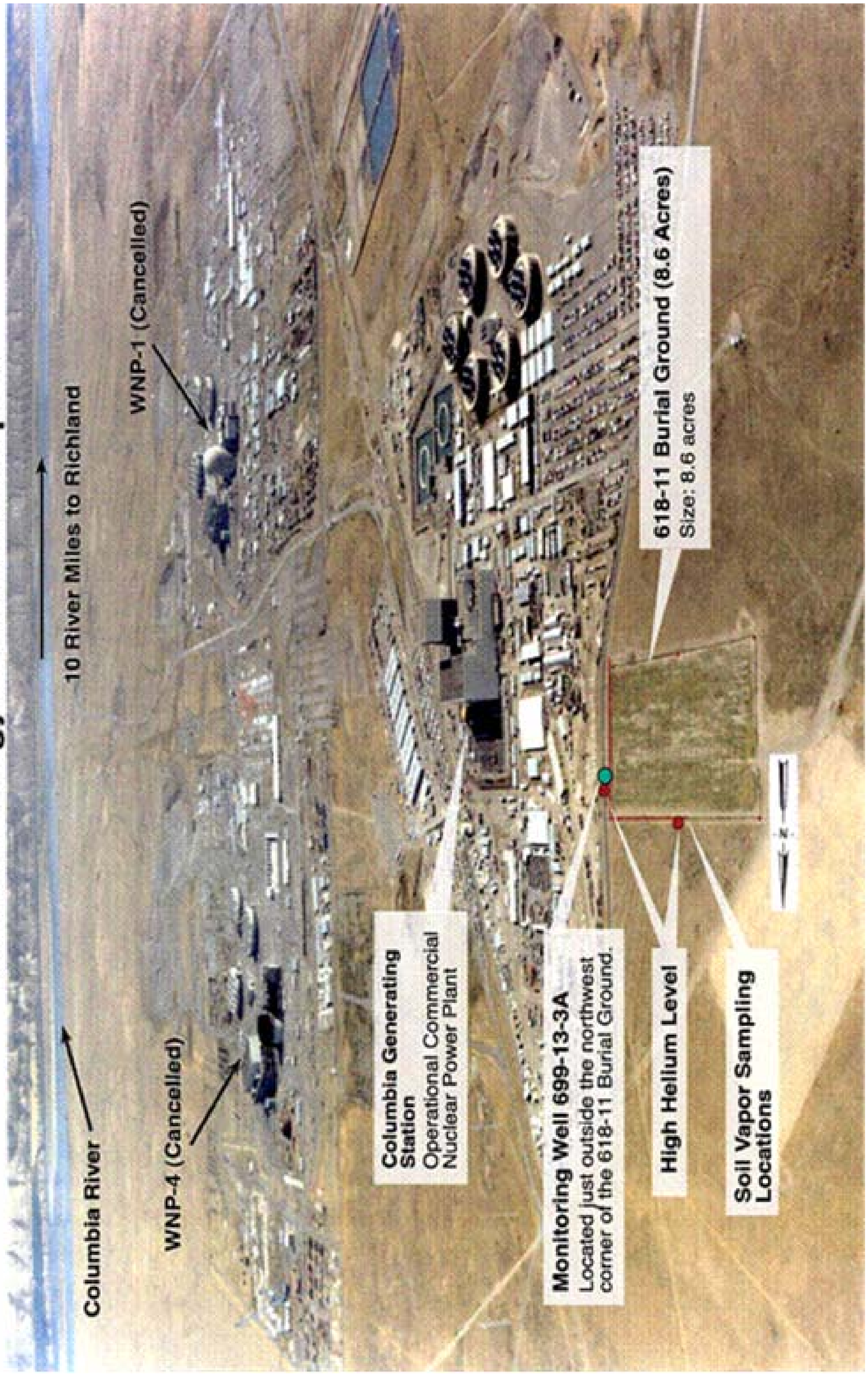


Figure B-6. The 618-11 Burial Ground.

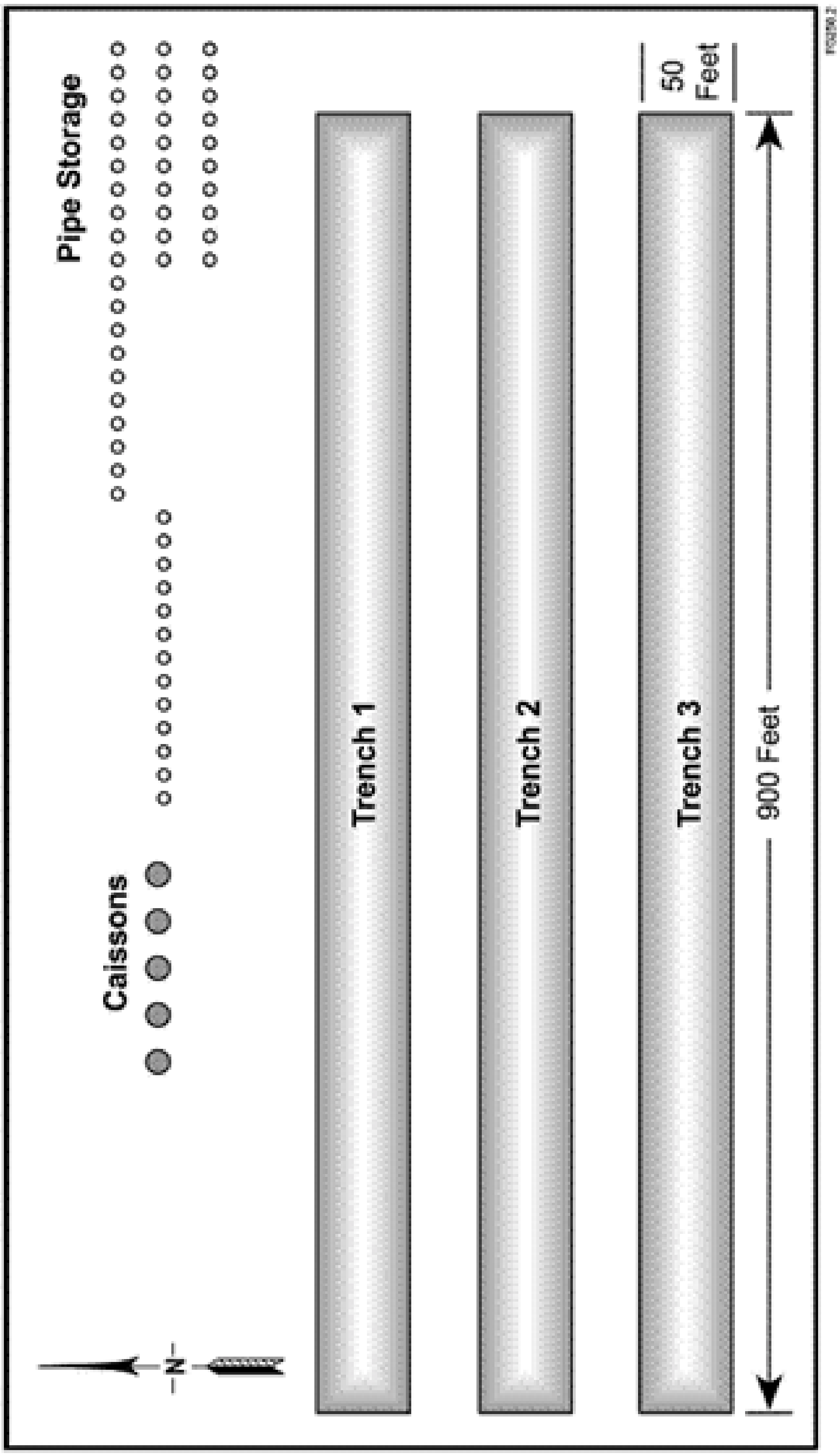


Figure B-7. A 618-11 Burial Ground Caisson.

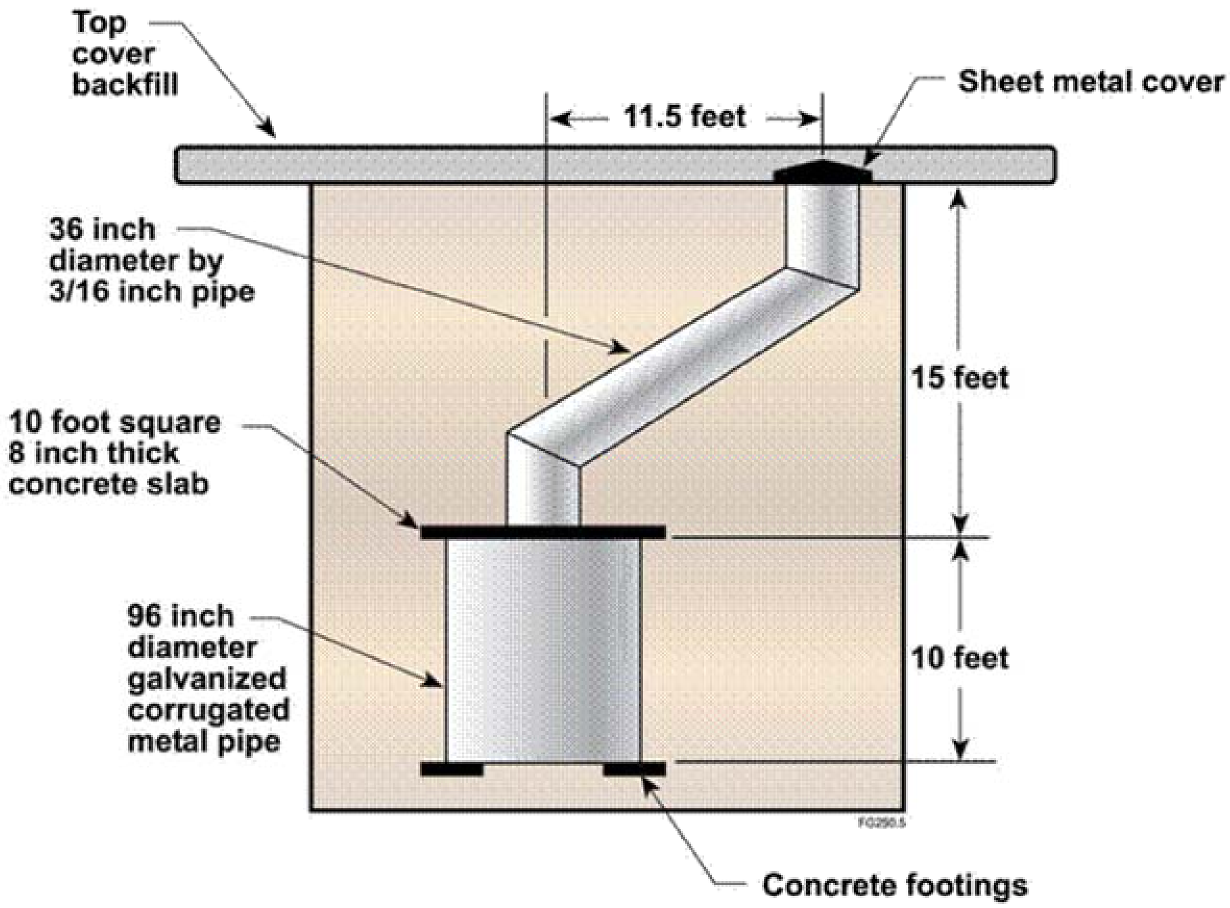


Figure B-8. Typical Layout for 618-10 and 618-11 Burial Grounds.

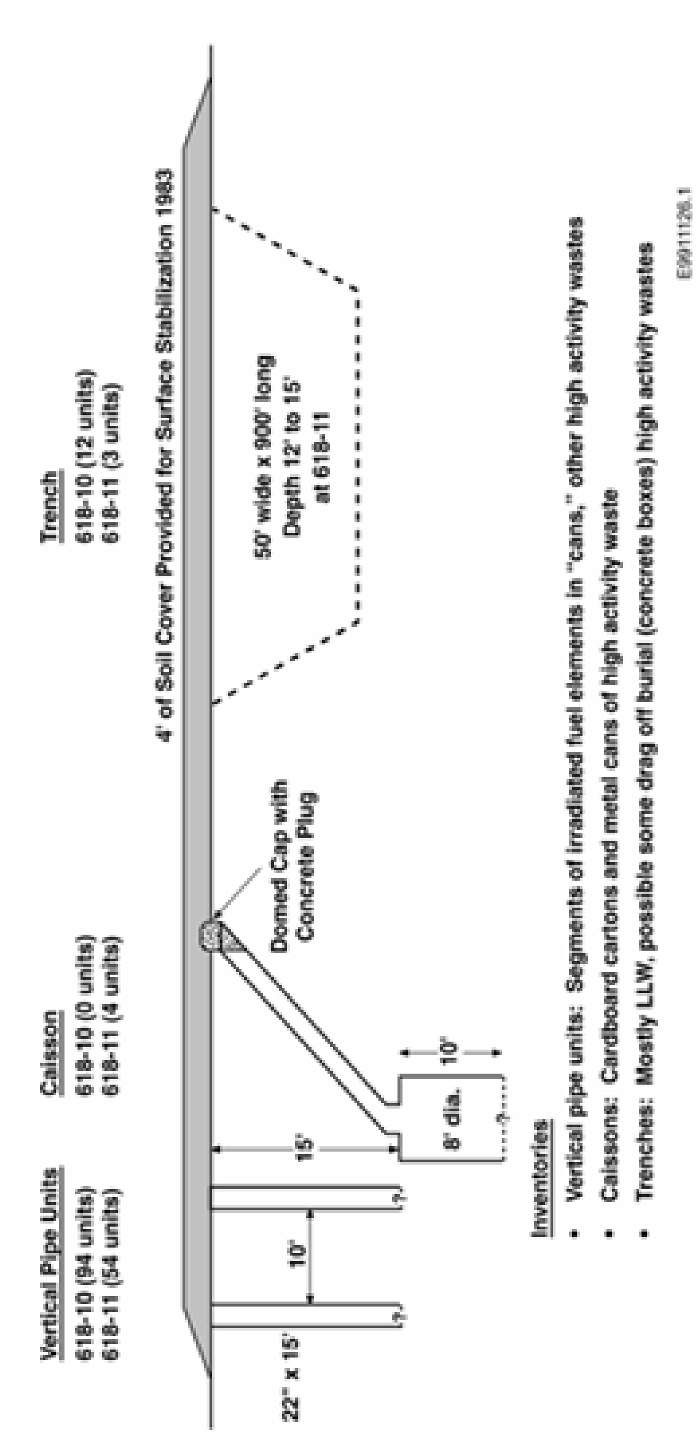


Table B-1. 618-11 Burial Ground Tritium Investigation Sampling/Measurement Activities and Summary. (2 pages)

Study Phase	Sampling/Measurement Activity and Sampling and Analysis Plan or Instruction and Date(s) of the Activity	Number of Wells or Sampling Points	Results Summary[a]
Phase I	Groundwater (existing well sampling) February 2000, PNNL-13228	22[b]	Indicated that high tritium concentrations are not widespread (i.e., plume is small).
Phase II	Groundwater (existing well resampling) August-October 2000; DOE/RL-2000-49	10[c]	Verified Phase I results.
Phase IIa	Round 1 Soil Gas (installation and sampling) August-September 2000; DOE/RL-2000-53, Rev. 0	55[d]	Indicated that the 618-11 Burial Ground is the source of tritium contamination; the plume exits the burial ground along the northeast site corner.
	Round 1 Groundwater Samples (installation and sampling) October 2000; DOE/RL-2000-53, Rev. 0	2	Confirmed elevated groundwater tritium concentrations to the east of the burial ground but indicated groundwater tritium to the north (adjacent to the burial ground fence line) was not elevated.
	Round 2, Part 1, Soil Gas Samples (installation and sampling) May 2001; DOE/RL-2000-53, Rev. 1	25	Indicated the limited extent of the tritium plume to the east (i.e., narrow, relatively short plume).
	Round 2, Part 2: Completion of 618-11 Groundwater Investigation June 2001, DOE/RL-2001-13	6 boreholes 4 installed wells	DOE/RL-2001-13 to collect samples to define plume extent (lateral and vertical) and install wells for permanent groundwater monitoring.
	Round 2, Part 2, Soil Gas Sample Results and Interpretation September 2001; PNNL-13675	--	Refined the relationship between soil gas helium ratios and groundwater tritium concentrations.
	Drilling Report for Round 2, Part 2 September 2001, BHI-01567	--	Summarized drilling and construction data.
	Tritium Groundwater Investigation at the 618-11 Burial Ground, September 2001	--	Discussed results of the Round 2, Part 2 Investigation.

[a]See cited report for data summaries.

[b]The Sampling and Analysis Instruction identified 27 wells, but only 22 could be sampled to collect representative samples.

[c]DOE/RL-2000-49 identified 11 wells, but only 10 could be sampled to collect representative samples.

[d]Includes an additional point installed in an attempt to reach groundwater.

-- Not applicable.

NOTE: This table is an excerpt from Borghese, J. V., W. J. McMahon, and R. W. Ovink, 2001, *Tritium Groundwater Investigation at the 618-11 Burial Ground, September 2001*, Letter report from Bechtel Hanford, Inc., to U.S. Department of Energy, Richland, Washington.

Table B-1. 618-11 Burial Ground Tritium Investigation Sampling/Measurement Activities and Summary. (2 pages)

Study Phase	Sampling/Measurement Activity and Sampling and Analysis Plan or Instruction and Date(s) of the Activity	Number of Wells or Sampling Points	Results Summary[a]

BHI-01567, *Borehole Summary Report for the 618-11 Burial Ground Tritium Investigation*.

DOE/RL-2000-49, *Sampling and Analysis Plan for Phase II Plume Investigation Near Burial Ground 618-11*.

DOE/RL-2000-53, *Soil Vapor/Groundwater Sampling and Analysis Plan for Phase IIA Plume Investigation Near Burial Ground 618-11*, Rev. 0 and Rev. 1.

DOE/RL-2001-13, *Sampling and Analysis Plan for 618-11 Tritium Investigation Phase IIa Continuation: Plume Nature and Extent*.

PNNL-13228, *Evaluation of Elevated Tritium Levels in Groundwater Downgradient from the 618-11 Burial Ground Phase I Investigations*.

PNNL-13675, *Measurement of Helium-3/Helium-4 Ratios in Soil Gas at the 618-11 Burial Ground*.

B12.0 REFERENCES

10 CFR 830, “Nuclear Safety Management,” Title 10, *Code of Federal Regulations*, Part 830, as amended.

53 FR 12449, “Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington; Record of Decision (ROD),” *Federal Register*, April 14, 1988.

Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 USC 9601 et seq.

BHI-01567, 2001, *Borehole Summary Report for the 618-11 Burial Ground Tritium Investigation*, Bechtel Hanford, Inc., Richland, Washington.

CCN 098537, 2002, “Preliminary Cost Estimate and Project Level Schedule for 618-10 and 618-11 Burial Grounds,” S. E. Parnell to R. A. Carlson, Bechtel Hanford, Inc., Richland, Washington, May 1.

DOE/EIS-0113, 1987, *Final Environmental Impact Statement for Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes*, U.S. Department of Energy, Washington, D.C.

DOE/EIS-0286D2, 2003, *Revised Draft Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement,* U.S. Department of Energy, Washington, D.C.

DOE/RL-95-73, 2002, *Operation and Maintenance Plan for the 300-FF-5 Operable Unit,* Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-99-40, 2000, *Focused Feasibility Study for the 300-FF-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-99-53, 2000, *Proposed Plan for the 300-FF-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2000-49, 2000, *Sampling and Analysis Plan for Phase II Plume Investigation Near Burial Ground 618-11*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2000-53, 2000, *Soil Vapor/Groundwater Sampling and Analysis Plan for Phase IIA Plume Investigation Near Burial Ground 618-11*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2000-53, 2001, *Soil Vapor/Groundwater Sampling and Analysis Plan for Phase IIA Plume Investigation Near Burial Ground 618-11*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-13, 2001, *Sampling and Analysis Plan for 618-11 Tritium Investigation Phase IIa Continuation: Plume Nature and Extent*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-47, 2002, *Remedial Design Report/Remedial Action Work Plan for the 300 Area*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-48, 2002, *300 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington, as amended.

EPA, 2001, *Interim Action Record of Decision for the 300-FF-2 Operable Unit, April 2001*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

Hanford Advisory Board, 2002, "100/300 Area Change Package (HAN Consensus Advice #125) (letter from T. Martin, Chair, Hanford Advisory Board, to K. A. Klein, U.S. Department of Energy, Richland Operations Office; J. Iani, U.S. Environmental Protection Agency, Seattle, Washington; and T. Fitzsimmons, Washington State Department of Ecology, Olympia, Washington), February 8.

Oregon Office of Energy, 2002, "Oregon Office of Energy Comments on 100/300 Areas Change Packages" (letter from K. Niles to Chris Smith, U.S. Department of Energy), Oregon Office of Energy, Salem, Oregon, February 27.

PNNL-13228, 2000, *Evaluation of Elevated Tritium Levels in Groundwater Downgradient from the 618-11 Burial Ground Phase I Investigations,* Pacific Northwest National Laboratory, Richland, Washington.

PNNL-13675, 2001, *Measurement of Helium-3/Helium-4 Ratios in Soil Gas at the 618-11 Burial Ground*, Pacific Northwest National Laboratory, Richland, Washington.

Tritium Groundwater Investigation at the 618-11 Burial Ground, September 2001, 2001, Letter report from J. V. Borghese, W. J. McMahon, and R. W. Ovink, Bechtel Hanford, Inc., to U.S. Department of Energy, Richland Operations Office, Richland, Washington.

ATTACHMENT 1

<u>Partial Listing of 300 Area and 618-10 and 618-11 Burial Grounds Reference Documents</u>

AEC. 1962. *Layout of the 618-10 Burial Ground (aka 300 North Burial Ground; 318-10).* AEC Drawing No. H-3-9982.

AEC. 1979. *Plot Plan for 618-11 Burial Ground (aka 300 Wye Burial Ground; "Y" Burial Ground; 318-11).* AEC Drawing No. H-6-930.

Bergstrom, K. A., D. J. Brolin, and T. H. Mitchell. 1997. *Geophysical Investigation of the 618-10 and 618-11 Burial Grounds, 300-FF-2 Operable Unit.* BHI-00291, Rev. 1, September 1997. Prepared by CH2M HILL Hanford, Inc. for Bechtel Hanford, Inc., Richland, Washington.

Borghese, J. V., W. J. McMahon, and R. W. Ovink. 2001. *Tritium Groundwater Investigation at the 618-11 Burial Ground, September 2001.* Letter report from Bechtel Hanford, Inc. to U.S. Department of Energy, Richland, Washington.

Deford, D. H., R. W. Carpenter, and M. W. Einan. 1994. *300-FF-2 Operable Unit Technical Baseline Report.* BHI-00012, Rev. 00. Bechtel Hanford, Inc., Richland, Washington.

Demiter, J. A. and W. O. Greenhalgh. 1997. *Characterization of the 618-11 Solid Waste Burial Ground, Disposed Waste, and Description of the Waste-Generating Facilities.* HNF-EP-0649, October 1997. SESC. Prepared for Waste Management Federal Services, Inc., Richland, Washington.

DOE/RL. 1993. *618-11 Burial Ground Expedited Response Action Proposal.* DOE/RL-93-49. U.S. Department of Energy, Richland, Washington.

DOE/RL. 1994. *300-FF-2 Operable Unit Remedial Investigation/Feasibility Study (RI/FS) Work Plan, Hanford Site, Richland, Washington.* DOE/RL-94-38, Draft A. U.S. Department of Energy, Richland, Washington.

DOE/RL. 1997. *Limited Field Investigation Report for the 300-FF-2 Operable Unit.* DOE/RL-96-42, Rev. 0. U.S. Department of Energy, Richland, Washington.

DOE-RL. 2000. *Focused Feasibility Study for the 300-FF-2 Operable Unit.* DOE/RL-99-40, Rev. 0. U.S. Department of Energy, Richland, Washington.

DOE-RL. 2000. *Proposed Plan for the 300-FF-2 Operable Unit.* DOE/RL-99-53, Rev. 0. U.S. Department of Energy, Richland, Washington.

DOE-RL. 2001. *Sampling and Analysis Plan for 618-11 Tritium Investigation Phase IIa Continuation: Plume Nature and Extent.* DOE/RL-2001-13, Draft A. U.S. Department of Energy, Richland, Washington.

DOE-RL. 2002. *300-FF-5 Operable Unit Sampling and Analysis Plan.* DOE/RL-2002-11, Rev. 0, May 2002. Prepared by CH2M HILL Hanford, Inc. for U.S. Department of Energy, Richland, Washington.

DOE-RL. 2002. *Operation and Maintenance Plan for the 300-FF-5 Operable Unit.* DOE/RL-95-73, Rev. 1, May 2002. Prepared by CH2M HILL Hanford, Inc. for U.S. Department of Energy, Richland, Washington.

DOE-RL. 2002. *Remedial Design Report/Remedial Action Work Plan for the 300 Area.* DOE/RL-2001-47, Rev. 0, June 2002. U.S. Department of Energy, Richland, Washington.

DOE-RL. 2002. *300 Area Remedial Action Sampling and Analysis Plan.* DOE/RL-2001-48, Rev. 0, June 2002. U.S. Department of Energy, Richland, Washington.

Dresel, P. E., B. A. Williams, J. C. Evans, R. M. Smith, C. J. Thompson, and L. C. Hulstrom. 2000. *Evaluation of Elevated Tritium Levels in Groundwater Downgradient from the 618-11 Burial Ground Phase I Investigations.* PNNL-13228, May 2000. Pacific Northwest National Laboratory, Richland, Washington.

Dresel, P. E. and M. P. Bergeron. 2001. *Evaluation of the Impact of Tritium Contamination in Groundwater from the 618-11 Burial Ground at the Hanford Site.* Letter report from P. E. Dresel and M. P. Bergeron, Pacific Northwest National Laboratory, to K. M. Thompson and M. J. Furman, U.S. Department of Energy, Richland Operations Office. Rev. 1, December 20, 2001, 17 pp.

EPA. 2000. *Explanation of Significant Difference for the 300-FF-5 Record of Decision (see EPA 1996 for original ROD).* Agreement Between U.S. Department of Energy and U.S. Environmental Protection Agency, with Concurrence by the Washington State Department of Ecology, June 2000. (adds groundwater beneath the 618-10 and 618-11 Burial Grounds to the 300-FF-5 Operable Unit)

EPA. 2001. *Record of Decision for Remedial Actions in the 300-FF-2 Operable Unit.* Agreement Between U.S. Department of Energy and U.S. Environmental Protection Agency, with Concurrence by the Washington State Department of Ecology, (April 2001).

EPA. 2001. *USDOE Hanford Site: First Five Year Review Report.* April 2001. Prepared by U.S. Environmental Protection Agency, Region 10, Hanford Project Office, Richland, Washington, pp. 300-1 to 300-17.

Faurote, J. M. 2001. *Borehole Summary Report for the 618-11 Burial Ground Tritium Investigation.* BHI-01567, September 2001. Prepared by CH2M HILL Hanford, Inc., for Bechtel Hanford, Inc., Richland, Washington.

Gerber, M. S. 1992. *Past Practices Technical Characterization Study – 300 Area – Hanford Site*. WHC-MR-0388, December 1992. Prepared by Westinghouse Hanford Company for U.S. Department of Energy, Richland, Washington.

Fluor Hanford. 2003. *618-10 and 618-11 Waste Burial Grounds Basis for Interim Operation*, CP-14592, Rev. 0, March 2003. Prepared by Fluor Hanford for U.S. Department of Energy, Richland, Washington.

Petersen, S. W., R. J. Cameron, M. D. Johnson, and M. J. Truex. 2001. *Technology Alternatives Baseline Report for the 618-10 and 618-11 Burial Grounds, 300-FF-2 Operable Unit.* BHI-01484, Rev. 1, September 2001. Bechtel Hanford, Inc., Richland, Washington.

Olsen, K. B., P. E. Dresel, and J. C. Evans. 2001. *Measurement of Helium-3/Helium-4 Ratios in Soil Gas at the 618-11 Burial Ground.* PNNL-13675, October 2001. Pacific Northwest National Laboratory, Richland, Washington.

Singleton, K. M. 1995. *Description of Work for the 300-FF-2 Limited Field Investigation at the 618-10 and 618-11 Burial Grounds.* BHI-00424, Rev. 00, July 1995. Bechtel Hanford, Inc., Richland, Washington.

Webb, C. R. 1993. *Miscellaneous Information Regarding Operation and Inventory of 618-10 Burial Ground.* WHC-MR-0415. Westinghouse Hanford Company, Richland, Washington.

Webb, C. R. 1993. *Miscellaneous Information Regarding Operation and Inventory of 618-11 Burial Ground.* WHC-MR-0416. Westinghouse Hanford Company, Richland, Washington.

ATTACHMENT 2

The following documents were generated by the Environmental Restoration Contractor before the transition of this scope of work to Fluor Hanford. Copies of these documents have been provided to Kevin Leary (RL) and Mike Goldstein (U.S. Environmental Protection Agency) for information.

"618-10 and 618-11 Burial Grounds – Safety Analysis Strategy," F. M. Corpuz to Distribution, dated March 9, 2001, CCN 087268

"Authorization Basis Strawman Strategy for the 618-10 and 618-11 Waste Sites," S. E. Parnell to R. A. Carlson, dated May 9, 2001, CCN 088959

"Preliminary Cost Estimate and Project Level Schedule for 618-10 and 618-11 Burial Grounds," S. E. Parnell to R. A. Carlson, dated May 1, 2002, CCN 098537

"Regulatory Evaluation of Remedial Actions at the 618-10 and 618-11 Burial Grounds," S. E. Parnell to R. A. Carlson, dated December 17, 2001, CCN 095081

"Results of the 618-10 and 618-11 Burial Grounds Document Search," L. C. Hulstrom to R. A. Carlson, dated May 2, 2001, CCN 088951

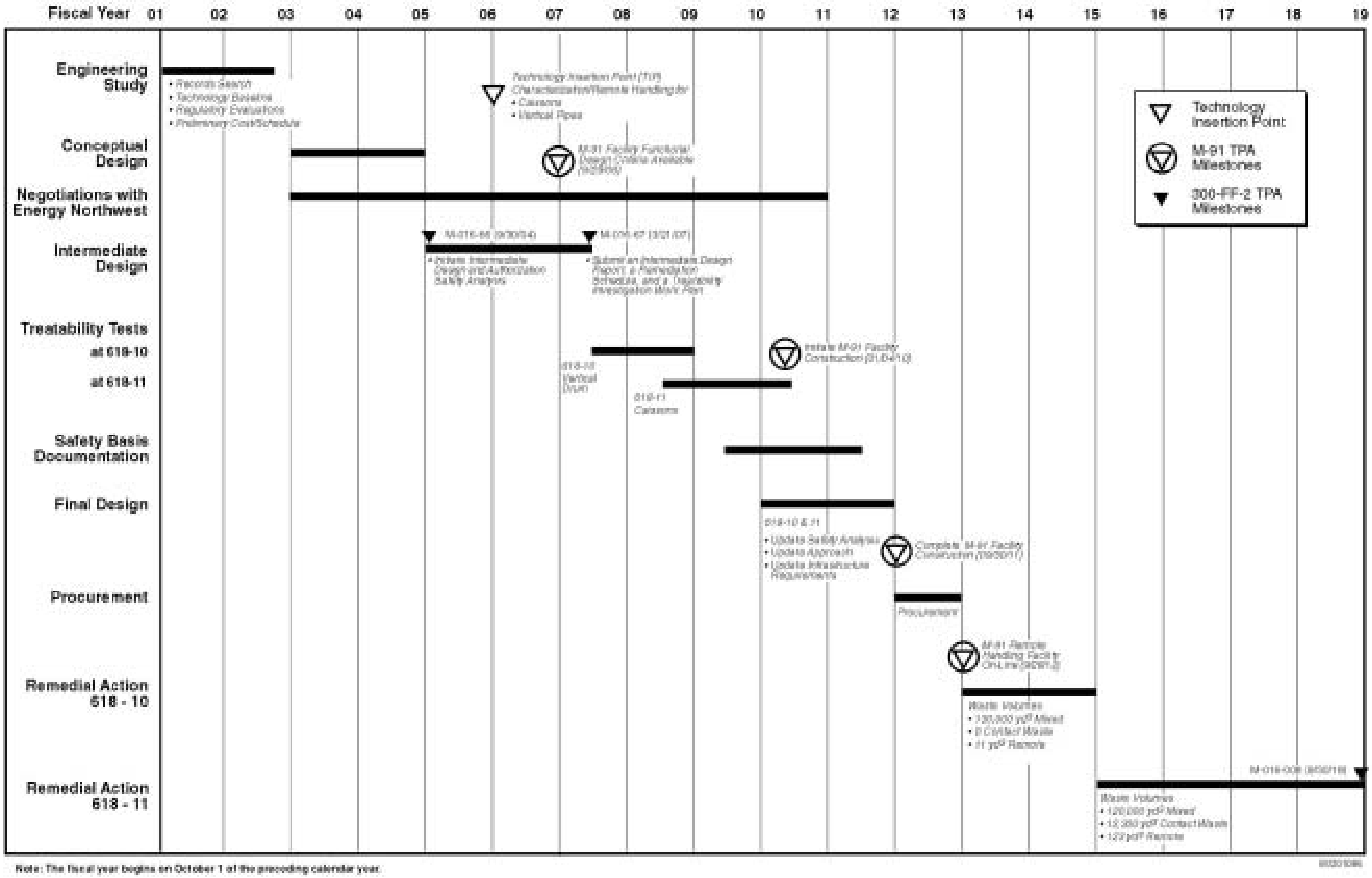
"Summary of the 300-FF-2 General Content Burial Ground and Outlying Waste Sites Document Search," L. C. Hulstrom to R. A. Carlson, dated January 2, 2002, CCN 095616

"Summary of the 618-10 and 618-11 Burial Ground Document Search," L. C. Hulstrom to R. A. Carlson, dated November 27, 2001, CCN 094585

Technology Alternatives Baseline Report for the 618-10 and 618-11 Burial Grounds, 300-FF-2 Operable Unit, (BHI-01484, Rev. 1), September, 2001

ATTACHMENT 3

Preliminary 618-10 and 618-11 Remediation Strategy



NOTE: The M-91 Series of Milestones in this schedule no longer exist as shown.

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APPENDIX C

WORKSHOP PRESENTATIONS

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APPENDIX C

WORKSHOP PRESENTATIONS

Electronic copies of presentations made at the workshop are included as separate files. The following presentations are available:

File name of presentation	Presenter(s)
618-10 & 11 Workshop Briefing	Larry Hulstrom and Scott Petersen, Fluor Hanford Groundwater Protection Program Kevin Leary, U.S. Department of Energy, Richland Operations Office
Sharing Lessons Learned	John Bickford, Project Hanford Lessons Learned Coordinator
INEEL Pit 9 Lessons Learned *(movie file included)*	John Shaffer, INEEL
Hanford 200 E & W and TRU Pilot Retrieval	Ken Hladek, Fluor Hanford
Hanford 218-W-4C&B Suspect TRU Retrieval	Doug Greenwell, Duratek Federal Services of Hanford, Inc.
Hanford 618-4 & 5 Lessons Learned *(movie file included)*	John April, Bechtel Hanford, Inc.
*[LANL TRU Waste Inspectable Storage Project]**	Charlie Villareal, Los Alamos National Laboratory
ORNL 22-Trench Area TRU Retrieval	David Bolling, ORNL
WIPP Lessons Learned	David Moody, LANL – Carlsbad Operations
Energy Northwest Perspective	John Arbuckle, Energy Northwest

*Presentation not available electronically. For questions, please contact Charlie Villareal, LANL, at cv@lanl.gov or (505) 665-6148.

INEEL = Idaho National Engineering and Environmental Laboratory.
LANL = Los Alamos National Laboratory.
ORNL = Oak Ridge National Laboratory.
TRU = transuranic.
WIPP = Waste Isolation Pilot Plant.

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